NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

RISK ASSESSMENT AND ANALYSIS OF THE M109 FAMILY OF VEHICLES FLEET MANAGEMENT PILOT PROGRAM

by

Stephen E. Hitz

December 1997

Principal Advisor: Keith F. Snider

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE

Form Approved.
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES
	December 1997	Master's Thesis

4. TITLE AND SUBTITLE RISK ASSESSMENT AND ANALYSIS OF THE M109 FAMILY OF VEHICLES FLEET MANAGEMENT PILOT PROGRAM

5. FUNDING NUMBERS

6. AUTHOR(S) Hitz, Stephen E.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*

The purpose of this thesis is to conduct a risk assessment and analysis for the M109 155mm Self Propelled Howitzer (SPH) Fleet Management Pilot Program. The objective of this program is to reengineer the fleet's logistical support system by outsourcing those functions which make sense and that can be performed more efficiently by private industry. This innovative approach places one contractor, or Fleet Manager, in charge of sustaining the entire fleet. The researcher used the Concept of Operations (CONOPS) Document for the program as the primary tool to conduct the risk assessment and analysis. Using the CONOPS Document as a preliminary Work Breakdown Structure, the researcher developed two surveys to identify and assess the risks associated with the program. These surveys enabled the researcher to develop a Risk Watchlist that identifies and prioritizes the most severe cost and performance risks. The researcher utilized this watchlist to develop Risk Charts to analyze the potential impact of these risk events. The Risk Charts graphically display both the risk events identified in the program and where they might occur. Developing similar Risk Watchlists and Risk Charts can assist DoD Project Managers in controlling and mitigating the risks associated with their programs.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Risk Assessment and Analysis, Fleet Management	116
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

RISK ASSESSMENT AND ANALYSIS OF THE M109 FAMILY OF VEHICLES FLEET MANAGEMENT PILOT PROGRAM

Stephen E. Hitz
Major, United States Army
B.S., United States Military Academy, 1986

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1997

ABSTRACT

The purpose of this thesis is to conduct a risk assessment and analysis for the M109 155mm Self Propelled Howitzer (SPH) Fleet Management Pilot Program. The objective of this program is to reengineer the fleet's logistical support system by outsourcing those functions which make sense and that can be performed more efficiently by private industry. This innovative approach places one contractor, or Fleet Manager, in charge of sustaining the entire fleet. The researcher used the Concept of Operations (CONOPS) Document for the program as the primary tool to conduct the risk assessment and analysis. Using the CONOPS Document as a preliminary Work Breakdown Structure, the researcher developed two surveys to identify and assess the risks associated with the program. These surveys enabled the researcher to develop a Risk Watchlist that identifies and prioritizes the most severe cost and performance risks. The researcher utilized this watchlist to develop Risk Charts to analyze the potential impact of these risk events. The Risk Charts graphically display both the risk events identified in the program and where they might occur. Developing similar Risk Watchlists and Risk Charts can assist DoD Project Managers in controlling and mitigating the risks associated with their programs.

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

A. BACKGROUND

Both the Secretary of Defense and the Chairman of the Joint Chiefs of Staff have emphasized that funding levels for modernization must increase if the Department of Defense (DoD) is to procure the new weapons it will need in the 21st century. [Ref. 10:p. 1] Budget constraints and the end of the Cold War have resulted in a steady decline in DoD's equipment modernization program. Today, procurement dollars account for a smaller percentage of the total DoD budget than in recent years. Unfortunately, future defense budgets are not projected to increase significantly over the next several years.

Although the DoD budget has declined significantly over the last several years, DoD still maintains a vast in-house support infrastructure which consumes a large and growing share of the DoD budget. Thus, the challenge for DoD is to shift resources from support to procurement. Many people believe that DoD can accomplish this task by outsourcing many of these support functions. The Defense Science Board and the Commission on Roles and Missions of the Armed Forces support an aggressive DoD outsourcing policy. Both committees believe that DoD can save billions of dollars annually by contracting out nearly all support functions to private industry. Such massive gains are not without risks. As a result, it is incumbent upon the military leadership to conduct a thorough risk assessment of all outsourcing initiatives.

The M109 Self Propelled Howitzer (SPH) Fleet Management Pilot Program is one of DoD's most ambitious efforts to capitalize on the potential benefits of outsourcing. The objective of the program is to significantly reduce life cycle support costs while improving operational readiness and performance of the fleet by implementing business process efficiencies. The M109 Fleet Management Pilot Program is an effort by the Army to improve the management of the M109 Fleet by outsourcing logistical sustainment functions for the entire fleet to a Fleet Manager. The Pilot Program will use the Fleet Manager to manage the total scope of operations supporting the production and sustainment of all M109 Family of Vehicles (FOV) units and other customers worldwide. The scope of items to be included in the Pilot Program includes the M109A2-A6 howitzer and the M992A0-A2 Field Artillery Ammunition Support Vehicle (FAASV).

As with all new programs, it is imperative to develop a formal risk management plan for the Pilot Program. This plan needs to identify, assess, analyze, control, and handle all the risks associated with the program. Failure to do so will undoubtedly undermine the projected benefits of the program.

B. OBJECTIVE

The objective of this thesis is to conduct a risk assessment and analysis for the M109 SPH Fleet Management Pilot Program. This thesis will identify, assess, and analyze the risks associated with outsourcing the specific functions outlined under the Pilot Program.

C. RESEARCH QUESTIONS

1. Primary Research Question

What are the most significant risks associated with implementing the M109 Fleet Management Pilot Program and how may these risks affect the program?

2. Secondary Research Questions

1. What is the current DoD policy regarding outsourcing and what are the advantages and disadvantages associated with outsourcing Government functions?

2. What is the M109 Fleet Management Pilot Program and what are the functions to be outsourced under this Pilot Program?

3. What is risk management and what are the current Department of Defense (DoD) policies and regulations guiding risk management?

4. What are the high risk events in each of the major areas of the program and how can these risks affect the program in terms of cost and performance?

5. Which areas in the program exhibit the highest degree of risk?

D. SCOPE

Almost every new program in DoD exhibits risks that can affect cost, schedule, and/or performance. This thesis will focus on identifying the specific risks associated with each of the potential functions to be outsourced under the Fleet Management Program. For this thesis, the researcher will consider the cost and performance risks associated with implementing the Pilot Program. Once the individual risk events are identified, the research will focus on prioritizing and assessing the risks by creating a Risk Event Watchlist. From the Watchlist, the researcher will identify the high risk areas in the program. Although risk mitigating methods and procedures will be discussed, this thesis will only assess and analyze the risks involved in the Pilot Program. The

researcher will not propose or analyze appropriate risk mitigation techniques for the program.

E. LITERATURE REVIEWS AND METHODS

The first objective of this research paper will be to provide an overview of the M109 Fleet Management Pilot Program. This will be accomplished primarily through a literature review of reports from the M109 Program Office. These reports include Business Case Studies, Cost/Benefit Analyses, Workshop Meetings, After Action Reports, and other miscellaneous reports involving implementation of Fleet Management. In addition, the researcher will explain how the Pilot Program supports current DoD outsourcing initiatives. This will be accomplished through a review of sources including periodicals, books, reports, and DoD Documents.

The next objective will be to provide an overview of risk management and DoD's policies and regulations concerning risk management. This will be accomplished through a literature review of both private sector and DoD risk management methods and procedures. In addition, the researcher will review current DoD policy outlined in the new DoD 5000 series documents.

The third objective of this thesis will be to identify potential risk events under each element of the Concept of Operations (CONOPS) Document. The researcher uses the CONOPS Document as the Work Breakdown Structure (WBS) for the program. The researcher will conduct interviews and surveys with technical experts in order to identify risk events involved in the Pilot Program. Functional area experts will identify risk events under each CONOPS element down to the third level.

The final objective of this thesis will be to quantify and analyze the identified risks. The researcher will accomplish this by conducting a survey with personnel involved in the program. This survey will ask personnel to quantify the probability of occurrence and severity of impact of each risk event identified. A Risk Event Watchlist will be developed to prioritize the most severe risks associated with the program. The researcher will apply this Watchlist back to the CONOPS Document in order to identify the high risk areas in the program.

F. DEFINITIONS AND ACRONYMS

Definition and acronyms common to DoD and the Army are noted throughout this document.

G. CHAPTER OUTLINE

This thesis assesses and analyzes the risks associated with the M109 FOV Fleet Management Pilot Program.

Chapter I. Introduction

The introduction will identify the focus and purpose of this thesis and will state the researcher's primary and subsidiary research question.

Chapter II. Outsourcing and Fleet Management Overview

This chapter will provide an overview of the Pilot Program and will identify and explain the specific functions to be outsourced in the program. In addition, the researcher will provide an overview of the current DoD outsourcing initiatives and outline both the potential advantages and disadvantages associated with outsourcing Government functions to private industry.

Chapter III. Risk Management Process

This chapter will discuss risk management concepts and methodologies utilized by both civilian and military organizations. The researcher will outline the risk management methods taught by both the Program Management Institute (PMI) and the Defense Systems Management College (DSMC). The researcher will conclude this chapter by explaining risk management policies and guidance outlined in the new DoD 5000 series documents.

Chapter IV. Risk Assessment

This chapter will identify the risks obtained from the surveys and interviews. The researcher will utilize a second round of surveys to quantify and prioritize the risk events. Each risk event will be categorized by the probability of occurrence and the severity of impact. The results from the surveys will be graphed on a risk rating diagram. From the diagram, a Risk Event Watchlist will be developed of the top-ten risk events in each of the program's major areas.

Chapter V. Risk Analysis

This chapter will apply the Risk Watchlist developed in Chapter IV back to the CONOPS Document. The researcher will develop a risk chart of the CONOPS Document and will categorize each CONOPS element according to the degree of risk each element exhibits. The researcher will analyze the high risk events in each CONOPS element and discuss their potential impact on meeting cost and performance objectives.

Chapter VI. Summary and Recommendations

This chapter will summarize the findings of the research by answering the research questions and will present recommendations for further research and study.

H. BENEFITS OF STUDY

This study will provide a Risk Event Watchlist and a Risk Chart for each major area for the M109 Fleet Management Program. The Watchlist is a potentially valuable tool for the Program Manager (PM) since it is a convenient way for the PM to track and prioritize different risk events associated with the Program. The Risk Chart will help the PM identify high risk areas in the program. Both products, the Risk Watchlist and the Risk Chart, will assist the PM in developing risk mitigating strategies. This research could also assist the PM in developing the Statement of Work (SOW) and in alerting contracting officers to potential high risk areas in monitoring the contract. Finally, as an Artillery Officer, the researcher will benefit from this research by gaining knowledge and experience working with a Field Artillery Program Office.

II. OUTSOURCING AND FLEET MANAGEMENT OVERVIEW

A. PURPOSE

This chapter first provides an introduction to outsourcing and explains Department of Defense (DoD) policy on outsourcing. This introduction brings together information from a number of high-level reports explaining the direction DoD is taking regarding outsourcing. The chapter then presents an overview on the M109 Fleet Management (FM) Program and how this program supports current DoD outsourcing initiatives. The researcher will first explain the background and objectives for the program. Then, the researcher will identify and explain the structure of the program and the functions to be outsourced under the program.

B. OUTSOURCING BACKGROUND

Outsourcing, which occurs in both the public and private sectors, refers to the transfer of a support function performed by an in-house organization to an outside service provider. While the Government or the outsourcing firm continues to provide the appropriate oversight, the vendor is typically granted extensive flexibility regarding how the work is performed. In successful outsourcing arrangement, the vendor has limited restrictions placed upon it. As a result, the vendor is able to utilize new technologies and business practices to improve service and/or reduce cost. Usually, the vendor is selected as the result of a competition among qualified bidders. [Ref. 5:p. 6]

Outsourcing is expanding rapidly in the private sector as more companies turn to outside sources to free management's time and energy to focus on the company's core competencies. While cost savings are a major factor in the growth of outsourcing, access to better technology and better qualified people are the primary reason. Public sector agencies at Federal, state, and local levels have also demonstrated the value of outsourcing in terms of saving money (30% plus savings) and providing better, more responsive service. [Ref. 5:p. 6A] Today, DoD is closely examining its outsourcing policy and initiatives to offset budget constraints and believes that an aggressive outsourcing initiative, if properly implemented, will improve services at significantly reduced costs.

C. DOD POLICY ON OUTSOURCING

Traditionally, DoD's approach to outsourcing follows a two-step process. First, DoD distinguishes "core" from "non-core" activities. Core activities, by definition,

cannot be outsourced and include all those activities that are directly involved in warfighting and/or activities for which no adequate private sector capability exists or can be expected to be established. DoD then divides non-core activities into those that DoD will produce internally and those that it will procure from an external source. The figure below represents this approach. [Ref. 1:p. 3]

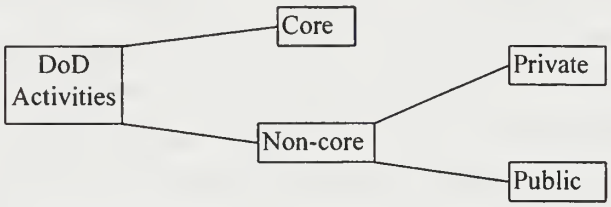


Figure 2.1. DoD Outsourcing Methodology [Ref. 1:p. 3]

In the past, DoD broadly defined core activities that included many support functions. As a result, an infrastructure has ballooned in DoD which costs billions of dollars annually to maintain. Today, DoD is attempting to redefine the concept of core activities by narrowing its scope to include only those activities that are "inherently Governmental"... activities that, for legal or constitutional reasons, it would be inappropriate to relinquish responsibility to an outside source. DoD's evolving policy supporting outsourcing is evident in several high level reports. Below is a description of these reports and their findings.

1. Commission on Roles and Missions of the Armed Forces (CORM)

The report from the CORM, which was published in 1995, was one of the first major documents to promote an aggressive DoD outsourcing initiative. The Commission realized that DoD could increase efficiency and save money by adopting more innovative business practices used in the private sector. These activities can drive down support costs and free money for needed readiness and modernization programs. The Commission believed that the Government in general, and DoD in particular, needed to reestablish the long-standing national policy of relying primarily on the private sector for services that need not be performed by the Government. Relying more on the private sector enhances competition which, for DoD commercial activities, typically lowers costs by 20 percent. These activities include social services, health services, Research, Development, Test, and Evaluation (RDT&E) support, base maintenance, education/training, installa-tion services, data processing, product manufacturing, equipment maintenance, and real property maintenance. By outsourcing these types of

activities, DoD would save $3 billion per year that could be reprogrammed for higher priority defense needs such as equipment modernization.

The Commission is confident its recommendations will increase competition, lower support costs, and improve performance. The following recommendations support outsourcing of sustainment activities for new and existing weapon systems:

- Outsource all commercial type support activities.
- Outsource new support requirements.
- Withdraw OMB Circular A-76; amend or repeal legislative restrictions.
- Move to a depot maintenance system relying on the private sector.
- Direct support of all new systems to competitive private contractors.
- Outsource selected material management activities.

Although there are enormous opportunities to outsource DoD commercial activities, not every activity should be performed in the private sector. The conditions for successful outsourcing are not always present, and the Government must retain certain core functions to protect public interest. Notwithstanding, the commission concludes its remarks by stating that outsourcing candidates include activities that range from routine commercial support activities, such as janitorial services, to highly-specialized support of military weapons. [Ref. 2:Chapter. 3]

2. Defense Science Board Task Force on Outsourcing and Privatization (DSB)

The DSB Task Force Report was charged to develop recommendations concerning ways DoD could use outsourcing as a tool to reduce support costs while simultaneously enhancing support effectiveness. Like the CORM, the Task Force was convinced that an aggressive outsourcing initiative would save DoD billions of dollars annually on support costs. In order to realize these savings, the Task Force recommended the Secretary of Defense (SECDEF) set a target for the year 2002 of $10 billion in outsourcing-related savings to fund investment programs. According to the Task Force, "a revolution in DoD business affairs is needed to pay for the revolution in DoD military affairs." [Ref. 5:p. 7A] This revolution will require DoD to:

- Change defense policies and procedures to facilitate outsourcing.
- Relieve legislative impediments and regulatory constraints.
- Improve defense contracting procedures and incentives to encourage greater reliance on outsourcing.

The Task Force's policy goal is to shift $7 -- $12 billion per year from support to modernization by the year 2002. The Task Force cites the decline in procurement funding while support funding continues to consume a progressively larger portion of the DoD budget. Below is a list that summarizes the key elements of an aggressive outsourcing strategy proposed by the Task Force:

- Establish a presumption for outsourcing.
- Reduce reliance for A-76.
- When A-76 is necessary, expedite the process and "level the playing field."
- Outsource broad support functions.
- Eliminate statutory and institutional impediments.
- Establish implementation plan with aggressive targets and milestones - hold senior managers accountable.

The Task Force stated that strong top-down leadership is critical to revolutionize DoD business practices. Presently, there are dozens of statutory requirements as well as mid-level resistance which impede progress. As a result, the Task Force recommends that the SECDEF reiterate in a formal policy statement that the private sector is the preferred provider of DoD support services. The Secretary should stress that all non-combat support services be considered for outsourcing except those functions that are inherently Governmental. DoD leadership must persuade the institution that it is committed to implementing an aggressive outsourcing program and that outsourcing is critical to the long term combat effectiveness of U.S. military forces. [Ref. 5:pp. 1-67]

3. Quadrennial Defense Review (QDR)

The QDR outlines the SECDEF's vision for the U.S. military as we move towards the 21st century. Secretary Cohen emphasizes that our military forces and operations are changing in response to new threats and advances in technology. As a result, the way we support the warfighter must also change. Under today's fiscal constraints, DoD must be more efficient and cost-effective in order to serve the warfighter faster, better, and

cheaper. The forces envisioned will require a different support structure. Achieving these forces will also require us to increase our investments in new weapon systems. To afford these critical investments, DoD will need to realize offsetting efficiencies in support operations.

Secretary Cohen strongly believes DoD must reduce the defense infrastructure in order to support our investment accounts. The Secretary states that infrastructure reductions have lagged force structure reductions. For example, from 1989 to 1997, DoD reduced total active duty military end strength by 32%. During the same period, DoD has only reduced domestic infrastructure by 21%. In addition, 61% of people employed by DoD in FY 1997 are performing infrastructure functions. Although Secretary Cohen believes our force structure is headed towards the 21st century, our infrastructure is still stuck in the past. As a result, Secretary Cohen promotes outsourcing as the critical component to reengineering DoD business practices.

The QDR devotes an entire section to reengineering the defense infrastructure: Section VIII - Achieving a 21st Century Defense Infrastructure. This section specifically outlines the actions DoD must take to reduce support costs. Below are the outsourcing initiatives recommended by the QDR to reduce the defense-wide infrastructure and the military department infrastructure:

- Outsource selected Defense Logistics Agency functions.
- Reengineer Defense Financial Accounting Service operations by consolidating and outsourcing accounting functions.
- Outsource selected patient care, medical training, and installation support in the Defense Health program.
- Combine operational commands and outsource monitoring activities.
- Compete, outsource, or privatize military department infrastructure functions that are closely related to commercial functions. Most of these actions involve logistics and installation support functions.

Secretary Cohen has established a Defense Reform Task Force to examine the best opportunities to outsource and privatize non-core activities. The results of this task force will be published later this year. [Ref. 10:Section VIII]

It is clear through the above reports that DoD is actively pursuing an aggressive outsourcing policy. DoD realizes that it can not afford to rely on a costly and outdated infrastructure. In addition, projected budget constraints will prevent DoD from funding investment accounts to the appropriate level unless dramatic changes are made. As a

result, DoD leadership plans to reengineer its support structure by adopting more commercial business practices. Many of these plans will promote outsourcing by narrowing the scope of activities that are considered inherently Governmental. DoD is starting to revert back to the principle that the Government should not perform private sector type functions unless a compelling need is demonstrated.

D. OUTSOURCING IMPEDIMENTS

DoD has been very successful in accomplishing its primary mission: to prepare for and fight military conflicts. As a result, it has been very hard to change the support infrastructure of DoD. Deputy Secretary of Defense, John White, stated, "the hardest thing to change are institutions that have been successful and need to change anyway." [Ref. 5:p. 37] However, due to fiscal constraints, DoD must change the way it supports the force. Unfortunately, there are many impediments to an aggressive DoD outsourcing strategy. The largest obstacles within DoD to outsourcing Government functions are statutory restrictions, congressional involvement, and the complexity and lack of equity in the A-76 public/private competition.

1. Statutory Restrictions and Congressional Involvement

Listed below are the key legislative provisions that restrict DoD's ability to outsource more support functions. [Ref. 5:p. 38A]

- 10 USC 2461 -- Mandates extensive reporting to Congress, including cost comparison study, prior to outsourcing any function performed by more than 45 DoD employees.

- 10 USC 2464 -- Requires SECDEF to identify core logistical functions that cannot be outsourced. Changing classification requires congressional approval.

- 10 USC 2466 -- States that no more than 40% of the funds available for depot level maintenance may be outsourced to private contractors.

- 10 USC 2469 -- Requires the SECDEF conduct a public/private competition before outsourcing any depot level maintenance workload with a value greater than $3 million.

- Section 8020 of the FY96 Appropriations Act -- Prohibits DoD from expending any funds to outsource DoD functions performed by more than 10 DoD civilian employees until a most efficient cost analysis has been completed and the results certified to congress.

The statutes listed above increase congressional involvement in outsourcing decisions. As a result, the present process complicates, delays, and discourages DoD efforts to implement an aggressive outsourcing strategy.

2. A-76 Process

OMB Circular A-76 describes the procedures that Federal agencies must follow in order to outsource functions performed by Government employees. This process mandates a public/private cost comparison between the private sector and the Government proposed "Most Efficient Organization" (MEO), when 10 or more civilian jobs are displaced. Outsourcing proceeds only when the private sector cost advantage over the MEO exceeds 10%.

The A-76 process is complex and time-consuming. The process, which requires extensive documentation and reporting, can delay implementation of outsourcing decisions by up to 48 months. As a result, most DoD managers are discouraged and place their priority on initiatives that can be implemented in a shorter time frame. Also, A-76 competitions are inequitable and generally favor the Government entity. DoD organizations usually lack the accounting systems needed to ensure accurate allocation of indirect costs. As a result, Government proposals may not include all relevant costs needed for a fair competition. Finally, A-76 competitions usually focus on cost and often do not consider other important factors such as quality of service and responsiveness. As is the case with the congressional statutes, the A-76 process stifles initiative and prevents DoD from implementing best business practices. [Ref. 5:p. 41A]

E. ADVANTAGES AND DISADVANTAGES OF OUTSOURCING

Today, DoD relies on the private sector to provide many support functions. Proponents of outsourcing often cite the benefits of contracting out non-core functions to private industry. First, by contracting out a service provided by the Government, the Government is relieved of the day-to-day operations and support of that service. Although the Government will be required to provide oversight on the contract, the Government's work load would be greatly reduced. This will enable the Government to focus on more critical functions.

Second, contracting out services normally performed by the Government will promote competition and stimulate economic growth in a community. Enhanced competition normally leads to greater efficiencies and improved services.

Finally, outsourcing proponents believe economic efficiencies always follow from increased competition. Today, it is assumed that private industry operates more

efficiently than the Government. Private industry is less constrained by legal and statutory requirements or by socio-economic goals. Contractors consider life-cycle costs and are motivated by profit. A contractor has the incentive to operate efficiently to maximize its profit. The Government does not have this same profit incentive to motivate efficiency. [Ref. 26:pp. 11-12]

Not all services provided by the Government can or should be outsourced. There are many disadvantages to outsourcing that must be considered. First, potential efficiency gains from outsourcing benefit the Government only if the Government is able to write an effective contract. Unfortunately, it is hard to craft a contract that is beneficial to both the Government and industry for a complex outsourcing arrangement. Also, the Government lacks experience in developing and negotiating this type of contract. On the other hand, a private firm, which is motivated by profit, is likely to have more experience in entering this type of contract.

Second, many key decision-makers associate contracting out defense services with fraud and abuse. Although the most serious problems stem from only a few bad contractors, Government officials still fear that contractors, when given the opportunity, will take advantage of the Government by passing major costs on to the Government.

Third, there is a lack of competition in many markets. Competition stimulates markets and forces private firms to operate efficiently and to market the best available buys to the consumer. When competition is weak or non-existent, the supplier gains a tremendous advantage by setting the price. In this situation, the Government usually has no choice but to pay the asking price. [Ref. 26:pp. 16-19]

Finally, many field commanders want more real-time control of their assets during contingencies. By contracting out logistical functions, DoD abdicates this critical mission and responsibility and is forced to rely on a contractor for sustainment operations.

F. M109 FOV FLEET MANAGEMENT PILOT PROGRAM

The M109 Fleet Management Program goal is to create significant savings in life-cycle support and procurement costs that can be redirected to modernize the M109 FOV. To accomplish this goal, dramatic changes to the Army's logistical system will be needed to improve engineering and logistical functions of the fleet. The result will enhance weapon system performance as well as reduce operational and support costs. The general approach in achieving this goal is to implement both better commercial business practices and a fleet management approach by outsourcing functions related to the logistical

sustainment of the system. Fleet Management is a new Army initiative to examine what cost savings can be accrued by putting a single entity in charge of maintaining the fleet. The Pilot Program was developed by PM Paladin/FAASV in response to directives and guidance from the Army Acquisition Executive, the Commanding General, Army Material Command, the CORM, and other DoD activities to maximize the use of contractor provided, total life-cycle logistical support. [Ref. 17:p. 1]

1. Background

The M109 FOV consists of the M109A2/A3, M109A4/A5 and the M109A6 Paladin 155mm Self Propelled Howitzers as well as the M992A0/A1/A2 Field Artillery Ammunition Support Vehicles (FAASV). The M109A6 Paladin is being produced and fielded to active duty units to replace the M109A2/A3 models. There are also plans to field National Guard units to replace their M109A4/A5 models. As of April 1997, estimates of assets in the M109 FOV are: [Ref. 17:p. 1]

- M109A2/A3 = 865 (Reduced as A6 Paladin production continues)
- M109A4/A5 = 1017 (National Guard)
- M109A6 = 520 (Eventually approximately 914)
- M992A0 = 270 (Reduced as A2 production continues)
- M992A1 = 124 (Reduced as A2 production continues)
- M992A2 = 395 (Eventually approximately 885)

In addition, 5800 vehicles have been sold to foreign countries under the Foreign Military Sales (FMS) Program.

The life-cycle support for the M109 FOV is provided by multiple Government and industry organizations using different processes to provide both services and supplies. Figure 2.2 depicts the current problem with the fleet. First, duplicative infrastructure and processes are common throughout the fleet: no one entity or organization is in charge. The Program Management Office (PMO), the US Army Tank Automotive and Arma-ments Command (TACOM) -- Armament Research, Development, and Engineering Center (ARDEC), TACOM -- Armaments and Chemical Acquisition Logistical Activity (ACALA), and the Defense Logistics Agency (DLA) provide program asset management, technical support, and inventory control point service. At the wholesale level, procure-ment and overhaul activities are inefficient and costly. The Government and production

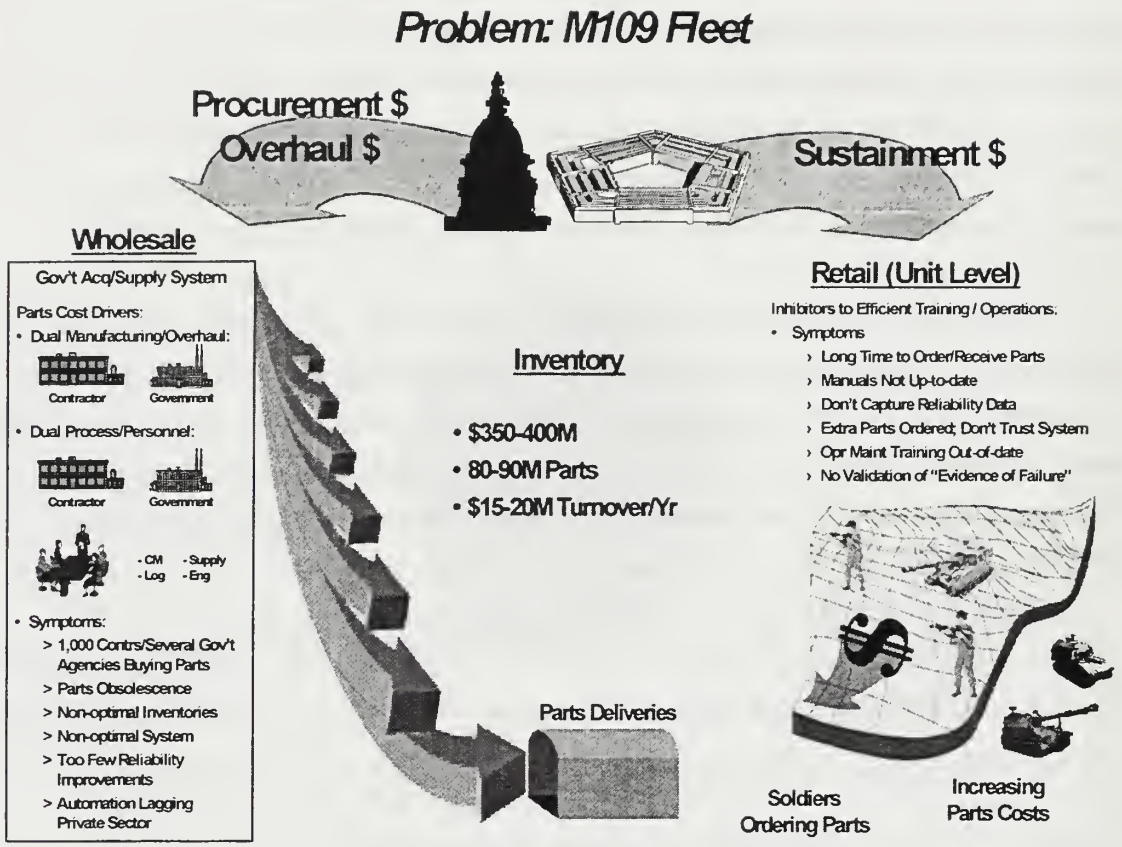


Figure 2.2. Problem: M109 Fleet [Ref. 18:p. 6]

contractor acquire and provide common and unique parts for initial provisioning, production, modification, repair, overhaul, and war reserves. This redundant and inefficient infrastructure results in parts obsolescence, surplus inventories, few reliability improvements, and outdated automation systems. The inventory of spare parts is another big cost driver. These parts, which are maintained by the Government, incur personnel, storage, and upkeep costs. [Ref. 17:p. 2]

Sustainment activities at the unit level are also inefficient and costly. The following symptoms inhibit training and adversely affect readiness: excessive time to order and receive parts, outdated manuals, unreliable technical data, outdated operator maintenance training, and excessive parts ordered. The current infrastructure limits opportunity to achieve cost reduction, implement best business practices, improve weapon system performance, and modernize equipment. [Ref. 17:p. 2]

2. Objective

The objective of the M109 FOV Fleet Management Pilot Program is to reengineer the fleet's logistical support system by outsourcing those functions that make sense and can be performed more efficiently by private industry. This innovative approach places one contractor, or Fleet Manager, in charge of sustaining the entire fleet. Fleet Management does not abdicate the Government's responsibility of supporting the fleet, but transfers those functions to a private contractor who can manage and perform these support functions more efficiently.

The main goal of the Pilot Program is to create significant savings in life-cycle support costs that can be redirected to modernize the fleet. Concurrently, the Fleet Manager will improve operational readiness and performance by implementing best business practices and modernization by continuously upgrading spare parts and components. To realize these savings, the Pilot Program will reengineer business processes, streamline the supply pipeline, and implement technological improvements. [Ref. 17:p. 2] Figure 2.3 below describes the fleet management concept.

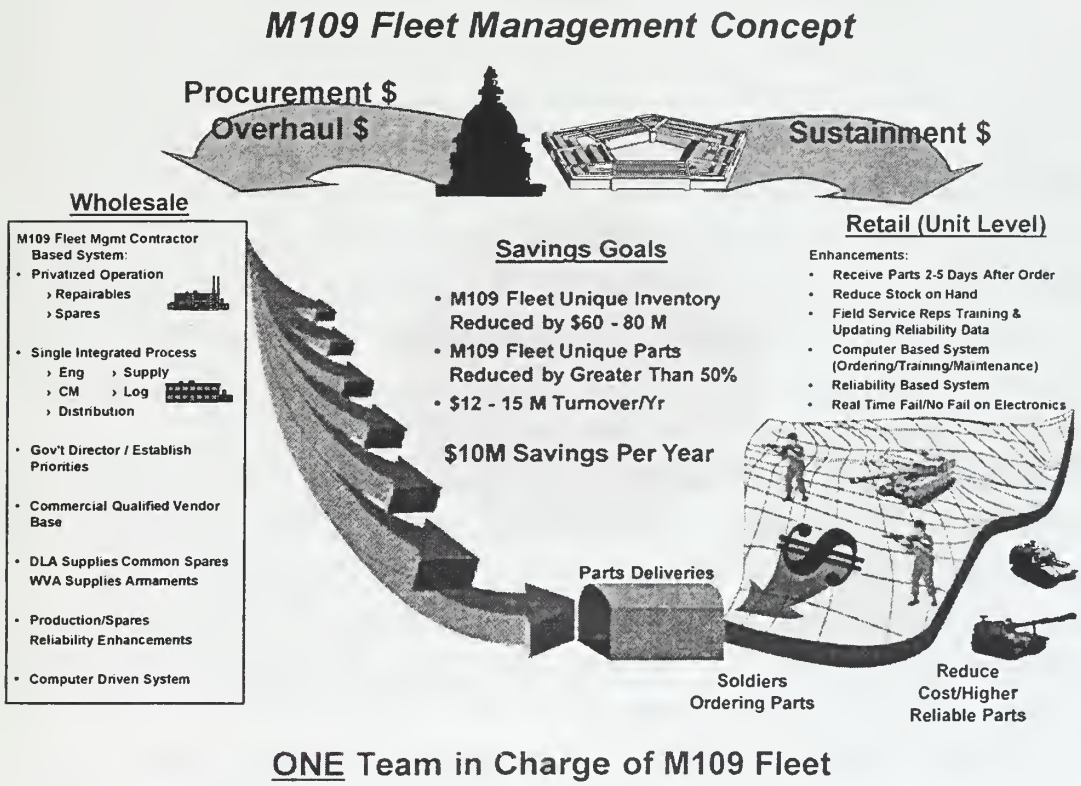


Figure 2.3. M109 Fleet Management Concept [Ref. 18:p. 7]

Procurement and overhaul savings are realized by eliminating the redundancies inherent in the current system by relying on the Fleet Manager for a single integrated process. The Fleet Manager will also own, control, and distribute spares/reparables by utilizing up-to-date automated systems. Finally, the Fleet Manager will be required to follow the Government's priorities in upgrading spare parts and components and in implementing reliability enhancements and Preplanned Product Improvements (P3I).

At the unit level, sustainment costs will also be significantly reduced. The following enhancements will improve the operational readiness and performance of the fleet: parts will be received 2-5 days using commercial agents, inventories will be reduced, field service training will be provided, and a computer based system for ordering, training, and maintenance will be established. If properly implemented, the Fleet Manager will achieve the projected cost savings by reducing the fleet unique inventory by 50% and by reducing the inventory turnover to $12-15 million annually. This will result in a 25-30% annual saving totaling $10 million.

G. OVERVIEW OF THE FLEET MANAGEMENT PILOT PROGRAM

The Army wants to have one organization in charge of weapon system life-cycle support. The Pilot Program will require the Fleet Manager to support the production and sustainment of the fleet worldwide. To accomplish this support, the Fleet Manager must be organizationally structured to provide a seamless, single information system between the Fleet Manager and its customers. The Fleet Manager is expected to establish an innovative process for the customer (the soldier) to efficiently communicate transactions over the internet/intranet from home station to the Fleet Manager. At unit and support maintenance levels, the soldier will be linked electronically to the Fleet Manager, which will facilitate technical support. The Fleet Manager will own all M109 FOV inventory. This will facilitate on-time direct delivery of materials to the soldier using commercial agents and will assist the modernization of components. The Fleet Manager will also be able to give the soldier access to real time inventory and financial information by accounting for all transactions on a single network. Financial transactions will be streamlined by credit/debit cards and electronic financial reporting. The Fleet Manager will maintain the single data base, accessible to all authorized customers, needed for life-cycle support activities. [Ref. 17:pp. 2-3]

Conceptually, the Fleet Manager should achieve greater efficiencies by broadening the scope of its functions. As a result, the M109 Fleet Management Concept includes many functions that have never been outsourced before. This approach is not without

risks, and presents the PM with many potential problems. Thus, central to the execution of the Pilot Program is the Government's Pilot Program Management and Oversight Group (MOG). This group will provide contract oversight and will oversee the preparation of the Statement of Work (SOW), Request for Proposal (RFP), performance metrics, and administration of the contract. The MOG will be the operational interface between the soldier and the Fleet Manager. In addition, it will coordinate weapon system configuration actions, review and certify data development, and establish guidance and priority on P3I and component upgrades. The MOG will also ensure accurate availability of data to Army and DoD legacy systems, coordinate all functions that must be retained as "inherently Governmental functions," assess the performance of the Fleet Manager through use of appropriate metrics, and coordinate the award of incentives associated with the contract. Other responsibilities include requirements determination, budgeting for modifications, participation on integrated product teams, quality assurance oversight, and cost performance tracking. [Ref. 17:p. 5]

The Concept of Operations Document (CONOPS) (Appendix A) outlines all the functions performed by the Government to sustain the fleet. Thus, it identifies all the functions that could potentially be outsourced to a private contractor under the Fleet Management Concept. This document, which was promulgated in February 1997, was developed by the Fleet Management Working Group under the direction and guidance of the Paladin Program Office. Participants of the working group included all Government agencies presently involved with the life-cycle support activities of the fleet. The Fleet Manager's functions can be subdivided into three major areas: Fleet Logistical Support, System Technical Support, and Manufacturing/Maintenance. These areas are summarized below.

1. Fleet Logistical Support

This area, which includes the functions of major and secondary item management (Class VII and IX), distribution and customer support, will require the Fleet Manager to adopt innovative business processes involving procurement, inventory management, requisitioning, distribution, and status reporting. It will transfer item management responsibilities for the fleet, within the scope of the Pilot Program, from the US Army Material Command (AMC) and the Defense Logistics Agency (DLA) to the Fleet Manager. Fleet Logistical Support consists of the following functions: [Ref. 21:pp. 2-8]

- Item Management -- computation of requirements providing direction for procurement, cataloging, repair, priority, distribution, and disposal to support the customer the fastest way at the lowest cost.

- Physical Distribution -- receive, store, account for, issue, transport, and provide visibility of material in support of wholesale and retail spare parts.

- Maintenance Management -- acquiring and providing the necessary expertise and information to maintain the system in the field and to provide soldiers instruction on how to maintain the equipment.

- Facilities Planning Management -- physical buildings and structures needed to properly store and maintain equipment in accordance with existing laws and regulations.

- Material Fielding -- providing the system hardware and support packages to the user while preparing the unit to accept, use, and maintain the system.

- Customer Support -- respond to the customer by providing technical and administrative support as required.

- Collect Performance Data -- gather data to assess system technical performance.

2. System Technical Support

The Fleet Manager is expected to establish a broad base technical capability that will provide a single point of contact for all technical activity needed for life-cycle support of the fleet. This integrated capability is needed for implementing best business practices. System Technical Support consists of the following functions: [Ref. 21:pp. 8-12]

- Engineering -- hardware and software general engineering functions to modernize the fleet through the insertion of technology to extend service life, improve operational capability, and lower support costs.

- Configuration/Change Management -- establish, maintain, document, and maintain accountability of all technical descriptions of the product configuration.

- Test & Evaluation -- performance validation and verification of new/ modified parts and systems.

- Product Improvement -- enhancement or upgrade of systems performance.

- Customer Support -- respond to the customer by providing technical support as required.

- Life Cycle Software Support -- develop, document, field, and maintain all software associated with fleet management.

3. Manufacturing/Maintenance (for End Items and Secondary Spares)

The Fleet Manager is expected to establish and maintain a repair/manufacturing capability to produce, modify, repair, and overhaul items as required. This will require the Fleet Manager to operate Class VII storage facilities and provide maintenance support for retail reparables by establishing and operating regional repair facilities, CONUS and OCONUS. The Fleet Manager's field service representatives will provide battalion-level diagnostic assistance. Manufacturing/Maintenance consists of the following functions: [Ref. 21:pp. 12-13]

- Manufacturing -- the capability of turning raw materials into a finished product, to include end items and secondary items.

- Maintenance -- the capability to perform maintenance of fielded items and facilities and equipment used to manufacture/maintain the item.

- Modification/Conversions -- the capability to alter and upgrade existing assets.

- End Item and Secondary Item Repair/Overhaul -- the capability to inspect, disassemble, repair and overhaul end item and secondary items.

H. SUMMARY

Senior DoD leaders agree with the CORM and the DSB recommendations supporting an aggressive outsourcing policy. The Department believes outsourcing non-Governmental functions can generate significant cost savings that can be redirected into the depleted investment accounts. The Pilot Program supports DoD policies and initiatives regarding outsourcing by establishing a Fleet Manager responsible for the total life-cycle logistical support for the M109 FOV.

The M109 Fleet Management Pilot Program is a bold and aggressive initiative to capitalize on the potential benefits of outsourcing. Unfortunately, these benefits do not come without major risks to the program. Therefore, in order to realize the cost savings proclaimed by the CORM and the DSB, a formal, systematic risk management process must be developed and implemented early on by the PM. The following chapter provides

a broad overview of risk management and describes how PMss can implement an effective and successful risk management program.

III. RISK MANAGEMENT OVERVIEW

A. PURPOSE

This chapter provides an introduction to, and an explanation of, risk management concepts and methodologies. First, the researcher will discuss the risk management process from the Project Management Institute's (PMI) body of knowledge. This process provides a business and industry perspective towards risk management. Next, the researcher will discuss the risk management process contained in current Defense Systems Management College (DSMC) publications. This process identifies current risk management principles being taught to the acquisition workforce. Finally, the researcher will discuss DoD policies outlined in the DoD 5000 series documents. These documents provide the current guidance on risk management to PMs.

B. RISK

Risk is a measure of the inability to achieve project objectives within defined cost, schedule, and technical constraints. Risk involves a notion of uncertainty and has two components: (1) the probability of failing to achieve a particular outcome and (2) the consequence of failing to achieve that outcome. [Ref. 6:p. 4.5-3] In considering the risks associated with a program, managers must identify those events and expected accomplishments, that, if not met, would have an adverse effect on the program. Risk actually constitutes a lack of knowledge or uncertainty concerning future events. We can define risk as the cumulative effect that these adverse events could have on a project's objectives. Future events that are favorable are called opportunities, whereas unfavorable events are called risks. [Ref. 22:p. 111]

Risk can also be defined as a function of uncertainty and damage. As either the uncertainty or damage increases, the risk increases as well. Another element of risk is the cause or source of the risk. We can denote this source of danger as a hazard. Certain hazards can be overcome or minimized by identifying them and taking actions or safeguards to overcome them. This leads to the conceptual equation that risk is a function of hazards and safeguards. Risk increases with hazards but decreases with safeguards. The implication of this equation is that good project management should identify hazards in order to allow safeguards to be developed to overcome them. If enough safeguards are available or developed, the risk can be eliminated or reduced to an acceptable level. [Ref. 15:p. 879]

To better understand risk, it is helpful to break risk into three distinct factors. These factors are risk events, risk probability, and the amount at stake.

1. Risk Events are those outcomes or occurrences that can have a negative impact on the program. The consequences of these negative events are described in terms of scope, quality, schedule, and cost.

    a. Scope Risks are those associated with changes to project scope (e.g., adding, deleting, and/or changing elements in the WBS.

    b. Quality Risks involve failure to complete tasks to the required level of technical or quality performance.

    c. Schedule Risks involve failure to complete tasks within the estimated time limits.

    d. Cost Risks involve failure to complete tasks within the estimated budget. It is important to note that risk in one of these four areas usually entails risk in one or more of the other areas.

2. Risk Probability is the likelihood of occurrence of each of the risk events.

3. Amount at Stake represents the severity or impact of the consequences, if a particular risk event occurs.

Once these factors are known for a given risk event, the risk event status can be determined using the following equation: **Risk Event Status = Risk Probability x Amount at Stake.** The most serious risks are those involving high probability and high severity. [Ref. 23:pp. 15-16]

C. RISK MANAGEMENT

By definition, undertaking a project involves risk since a project represents something new. The importance of risk management is to prepare in advance for possible adverse events, rather than responding as they occur. Risk management is an organized means of identifying and measuring risks and developing, selecting, and managing options for handling these risks. Today, there are several tools available to help the project office manage risks. The WBS, Statement of Work (SOW), and the Contractor's Proposal are just a few tools recommended as structures for assessing risks.

According to the Project Management Institute Body of Knowledge (PMBOK), there are three definitions of risk management: [Ref. 15:p. 880]

1. Risk management is a formal process by which risk factors are systematically identified, assessed, and provided for.

2. Risk management is a formal systematic method of managing which concentrates on identifying and controlling areas or events that have the potential to cause unwanted changes.

3. Risk management is the art and science of identifying, analyzing, and responding to risk factors throughout the life of the project.

Although different, all three definitions convey the same message. Project Managers need to develop a systematic approach to identify and sort through uncertainties, select those uncertainties that are most critical, and select ways to eliminate or reduce these uncertainties.

Proper risk management implies control and knowledge of future events and is proactive rather than reactive. It requires a forward thinking process, aimed at identifying risks and formulating strategies before the risk event has an impact on the program. A comprehensive risk management program examines all areas of the program at the appropriate level of detail throughout the life of the program. It requires early and continuous involvement from all members in the team. The goal of a PM's risk management plan will reduce not only the likelihood of an event from occurring, but also the potential magnitude of its impact. [Ref. 15:p. 880]

D. PMI'S RISK MANAGEMENT PROCESS

Proper risk management procedures are critical to the overall success of a project. Therefore, it is essential that a logical and systematic approach is followed. The approach advocated by PMI is a four-step process: risk identification, risk assessment, risk response, and risk documentation. PMI's approach is not only concerned with minimizing the consequences of adverse events, but also includes maximizing the results of positive events. PMI's four-step process is discussed in more detail below.

1. Risk Identification

During this phase, the PM will try to identify all the potential risks that are likely to affect the program. Risk identification is a continuous process that should be performed on a regular basis and includes consideration of internal as well as external risks. Internal risks are events that the PM can control such as staff assignments. External risks are those events that the PM has no control or cannot influence such as Governmental actions. Once the risk event has been identified, program objectives affected are assessed.

Various tools and techniques are available for risk identification. They include:

- Checklists - organized by sources of risks and include the project context, other process outputs, and project/technology issues.
- Flowcharts - developed to help the project team better understand the causes and effects of risks.
- Interviewing - conducted with various stakeholders to help uncover opportunities and threats not identified during normal planning activities.

Finally, the sources of the risk event are identified and categorized as to the PM's's ability to control them. Major sources of risk include changes to requirements, errors, misunderstandings, poor estimates, and insufficiently-skilled staff. [Ref. 22:pp. 111-114]

2. Risk Quantification

The next step, Risk Quantification, evaluates risk events and risk interactions to assess the range of possible project outcomes. The goal of this phase is to transform the risk event into some sort of quantifiable element that can be evaluated in light of the other risk events in the program. Risk Quantification helps to increase project team understanding and is primarily concerned with determining which risk events warrant a response. Thus, its overall objective is to help the PM select from among the numerous risks in the program, those which require the most attention.

Risk Quantification uses probability analysis. The risks that receive the closest attention are those which could have the greatest impact on the project and have the most likely probability of occurrence. Listed below are several tools and techniques that can help quantify the different risk events in a project: Expected Monetary Value, Statistical Sum, Simulation, Decision Tree Analysis, and Expert Judge. [Ref. 22:pp. 115-117]

Risk Quantification serves to list opportunities that should be pursued and risks that require mitigation. It also helps to document which risks the project manager has decided to either accept or ignore. [Ref. 22:pp. 115-118]

3. Risk Response Development

Now that the project manager has identified and quantified the risks at hand, he or she can now focus efforts and allocate resources to reduce/eliminate high risk areas. In other words, the project manager can start to formulate a plan or strategy to address either the opportunities or risks. Responses to opportunities are called enhancements, while risk responses to threats involve avoidance, mitigation, or acceptance. Below is a brief description of these risk response categories.

- Avoidance - eliminating a threat by eliminating the cause.
- Mitigation - reducing the risk by reducing the probability of occurrence and/or the severity or consequence.
- Acceptance - accepting the consequences of the risk either by active acceptance, such as developing a contingency plan, or by passive acceptance, such as accepting a lower profit.

The product of Risk Response Development is the Risk Management Plan. This plan should document the procedures that will be used to manage risk throughout the project. It covers who is responsible for managing the various areas of risks, how the identification and quantification output will be maintained, how contingency plans will be implemented, and how reserves will be allocated. [Ref. 22:pp. 119-121]

4. Risk Response Control

The final step in this risk management process involves executing the risk management plan over the course of the project. As anticipated risks occur or fail to occur, project personnel will implement their contingency plans. Since change is inevitable, it is impossible to correctly identify and plan for all risks. Therefore, the basic cycle of identify, quantify, and respond is repeated throughout the life of the project. When unplanned risk events occur, it is often necessary to perform work-arounds to respond to the risk event. Finally, the risk management plan should be continually updated as the project team responds to planned and unplanned risk events. [Ref. 21:p. 121]

E. DSMC'S RISK MANAGEMENT PROCESS

DSMC's Risk Management Process is limited to program risk management as it relates to the DoD acquisition process. The focus of their methodology is from a program office's viewpoint. DSMC's process is only concerned with minimizing the consequences of adverse events, whereas PMI addresses both risk and opportunity. Also, DSMC's process consists of a different set of phases from PMI's process. DSMC's process consists of planning, assessment, analysis, and risk handling (see Figure 3.1). This process is discussed in more detail below.

DSMC RISK MANAGEMENT PROCESS

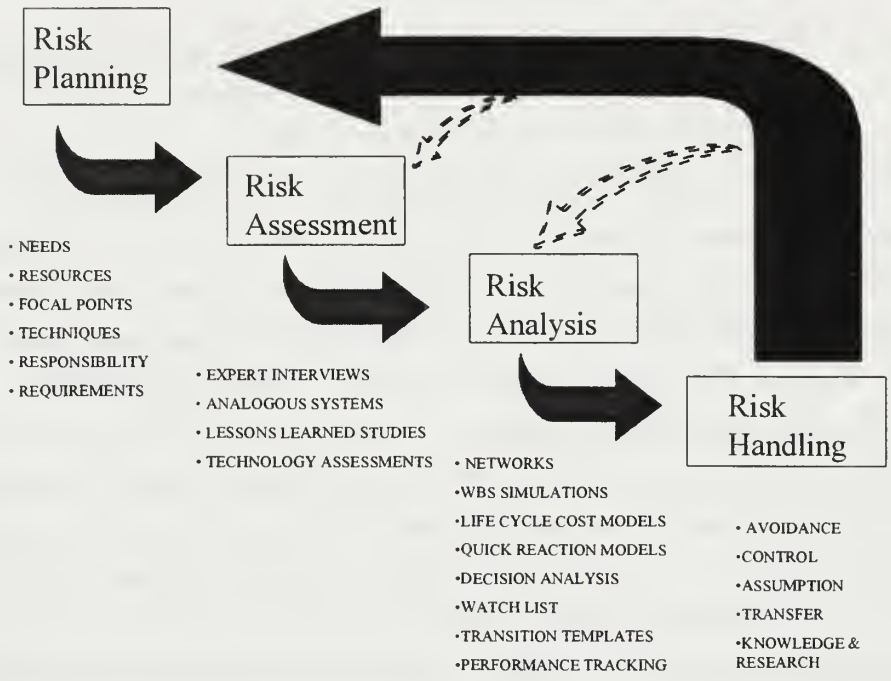


Figure 3.1. DSMC Risk Management Process [Ref. 7:p. 5-2]

1. Risk Planning

Risk planning consists of the early activities needed for a successful risk management plan. Early planning involves the development of an acquisition plan that facilitates the development of the risk management plan. Early risk plans should: [Ref. 4]

- State the purpose and objective for the plan.
- Identify additional technical expertise needed.
- Assign responsibilities for specific areas.
- Describe the risk assessment process and areas to consider.
- Delineate procedures for risk handling.
- Define a risk rating scheme and describe the risk monitoring metrics.

- Dictate the risk reporting and documentation needs.
- Establish a report format and schedule.

PMs should start the planning process from pre-solicitation period through program execution. The PM should structure the risk management plan, develop the acquisition strategy to support it, generate the RFP, write the source selection plan, evaluate proposals, and select the contractor, all with program risk as a key consideration. The purpose of risk management planning is to force organizations to allocate time and effort towards the subject and to develop a systematic approach to eliminating, minimizing, or containing the effects of undesirable occurrences.

2. Risk Assessment

Risk identification is the first step in the risk assessment process. Risks cannot be managed properly until they are identified and described in an understandable way. The WBS is often recommended for assessing risks, since the WBS encompasses the structure of everything that will be done or delivered in a program. Assessing each element in the WBS will, in most programs, ensure overall closure of the risk assessment. Other approaches include expert interviews, analogy comparisons, and the evaluation of program plans. [Ref. 7:pp. 4-5]

Preliminary quantification is the second and final step in the assessment process. This step is intended to provide some prioritization of the risks to facilitate further evaluation. The risk assessment process tends to handle risk in a probabilistic manner and the process is simplified when we are able to baseline the risk by defining total failure and total success. After defining a baseline position, it becomes easier to quantify risk in each impact area on a meaningful scale. This scale or rating scheme is built against an agreed set of definitions and provides a framework for eliminating some of the ambiguity in quantifying the risk. [Ref. 7:pp. 4-8]

As previously described, risk has two components: probability of occurrence and severity of impact. Using these components, we can develop a simple rating system based on a defined scale. Once in place, each risk event can be evaluated and quantified against this structure. Figure 3.2 offers a conceptual diagram that is often used to classify risk events.

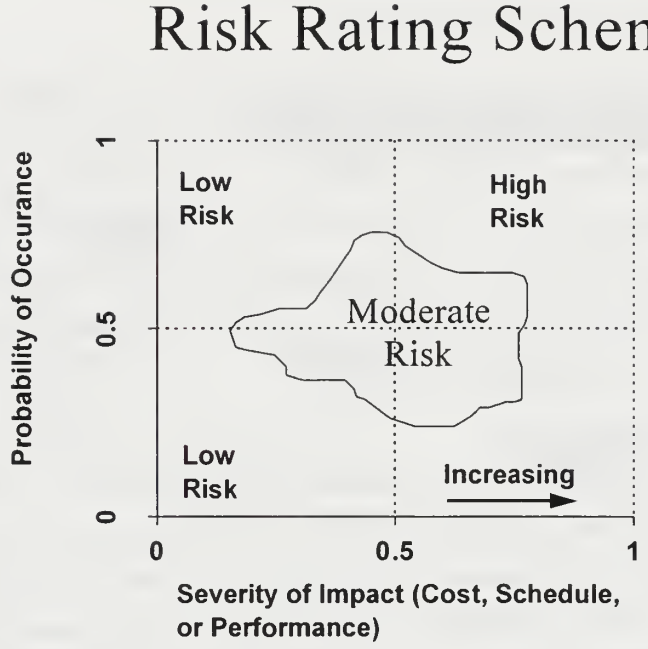


Figure 3.2. Risk Rating Scheme [Ref. 7:p. 3-2]

3. Risk Analysis

The transition from risk assessment to risk analysis is gradual and often ambiguous. Many activities normally performed in the analysis phase are actually conducted in the assessment phase and vice-versa. Risk analysis involves an examination of the consequences as risk input variables are changed. Its focus is to determine where and when consequences of risks are likely to occur, the magnitude of exposure, the risk drivers, and areas of greatest concern. One of the products of the analysis phase is the watchlist. The watchlist provides a means to track and document activities and actions performed in the risk analysis process. The PM has the flexibility to configure the watchlist in any manner it desires, allowing it to assess the risk management effort in a particular functional area. Usually, the watchlist is portrayed in a hierarchical ranking with the most severe risks (i.e., those with the highest Risk Event Status) at the top of the watchlist. The risk event with its corresponding Risk Event Status is listed in this manner to help prioritize areas that warrant greater attention and resources. [Ref. 7:pp. 4-8]

4. Risk Handling

Risk Handling is the final phase in the risk management process. It addresses the specifics on what should be done, when it should be accomplished, who is responsible, and the impact of the action or inaction. The most appropriate strategy is selected to obtain an acceptable risk level given program constraints and objectives. Risk Handling options usually fall into one of the following options: Risk Avoidance, Risk Control, Risk Assumption, Risk Transfer.

- Risk Avoidance - This involves changing the program's requirements, specifications, and/or practices to reduce the risks to an acceptable level. Avoidance eliminates the sources of high risks and replaces them with a lower risk solution.

- Risk Control - This involves monitoring and managing the risks in a manner that reduces the likelihood of occurrence and/or the severity of impact. It is a process of accepting risks and developing strategies to minimize their effect.

- Risk Assumption - This involves acknowledging that the risk exists and making a conscious decision to accept the risk level without any special effort to control the risk. This option is most suited for those risk situations that have been classified as low risk.

- Risk Transfer - This involves the reallocation of risk during the development and design process. Reallocation can be from one part of the system to another part or from the Government to the contractor. Risk transfer is a form of risk-sharing. Common risk transfer techniques used with contractors include performance incentives, warranties, and type of contract.

After the program's risks have been identified and assessed, the appropriate risk handling option must be developed. Each handling option is analyzed and those best fitted to accomplish program objectives are selected. Once the appropriate risk handling option is selected, the cost, schedule, and performance impacts to the program can be derived. [Ref. 7:pp. 4-11]

F. DOD RISK MANAGEMENT POLICIES

All PMs are responsible for establishing and executing a risk management program that satisfies the policies and procedures contained in the DoD 5000 series documents. The two primary documents that provide guidance to the PM are the DoDD 5000.1 and the DoDD 5000.2-R.

The DoDD 5000.1 emphasizes the need for a formal systematic approach to control risks in DoD acquisition programs. The DoDD 5000.1 states:

> PMs and other acquisition managers shall continually assess program risks. Risk must be well understood, and risk manage-ment approaches developed, before decision authorities can authorize a program to proceed into the next phase of the acquisi-tion process. To assess and manage risks, PMs and other acquisition managers shall use a variety of techniques, including technology demonstrations, prototyping, and test and evaluation. [Ref. 11:p. 4]

DoDD 5000.1 requires PMs to implement a risk management program. As mentioned above, program risk management plans must be addressed at each milestone decision point before approval is granted for the next acquisition phase. Risk aspects addressed at milestone decision point include: [Ref. 9:Sect 5-B-4]

- Cost, schedule, threat, technology, design and engineering, support, manufacturing, planned maintenance, and operations.
- Risks inherent in the degree of concurrency proposed.
- Risk contingencies associated with functional area plans (e.g. ,Acquisition Strategy and Plan, Configuration Plan, Integrated Logistical Plan, Soft-ware Development Plan, System Engineering Master Plan, Manufacturing Plan, Test and Evaluation Master Plan, etc.).

The DoDD 5000.2-R follows DoDD 5000.1 with more detailed guidance on managing risks. This document integrates risk management into the acquisition process, describes the relationship between risk and various acquisition functions, and establishes some reporting procedures. Specifically, DoDD 5000.2-R states: [Ref. 12:pp. 3-6]

> The PM shall establish a risk management program for each acquisition program to identify and control performance, cost, and schedule risks. The risk management program shall identify and track risk drivers, define risk abatement plans, and provide for continuous risk assessment throughout each acquisition phase to determine how risks have changed. The acquisition strategy shall include identification of risk areas of the program and a discussion of how the PM intends to manage those risks.

Today, DoD recognizes that risk management plays a vital role in the overall acquisition strategy and requires the PM take an active role in the risk management process. DoDD 5000.1 and DoDD 5000.2-R require PMs to develop a formal, systematic approach to identify, analyze, and control risks. This formal approach is forward-looking

and requires the PM to identify potential problems well before they can occur and develop strategies that reduce and/or eliminate their negative program impact.

G. SUMMARY

Although the risk management process between the Government and the private sector contains different terminology and viewpoints, they are essentially the same. Both processes seek to develop a formal approach to identify, assess, analyze, control, and document risk events throughout the life of the project.

The DoDD 5000 series requires all PMs to develop a systematic and structured risk management process. Although these documents primarily address Major Defense Acquisition Programs (MDAP), risk management must also be performed on all new DoD programs regardless of scope and complexity.

Fleet Management is an innovative attempt to reengineer the logistical support structure for a major weapon system. The potential benefits of the program are not without risk. As a result, it is imperative that the program follow the established risk management guidelines and procedures presented in this chapter. While there is no best technique for managing risk, PMs must take these principles and select the most appropriate risk management strategy for their program.

IV. RISK ASSESSMENT

A. PURPOSE

This chapter discusses the methodology and results of the risk assessment process. First, the researcher will discuss the CONOPS Document introduced in Chapter II as the main tool utilized for the risk assessment process. Second, the researcher will explain the methodology used in conducting the risk assessment for the program as discussed in Chapter III, Risk Management Overview. Third, the researcher will discuss the different surveys that were utilized to conduct the risk assessment and the results of these surveys. Finally, the researcher will develop a watchlist to identify the most significant risks associated with the program. It is important to note that the evaluation contained herein is a snapshot assessment of the program. Due to the dynamic nature of the program, the researcher only included in his assessment data received by 1 October 1997. As a result, many of the risk events, with their corresponding risk event status, will undoubtedly change as the program evolves.

B. CONCEPT OF OPERATIONS DOCUMENT (CONOPS)

In any new project, it is essential for the Government to articulate its requirements to the contractor in a clear and concise manner. Since Fleet Management is a new and untested concept, the PM's task of defining the scope of the requirements was very challenging. To accomplish this task, the PM formed a Fleet Management Working Group consisting of various functional experts who were either directly or indirectly involved in supporting the M109 FOV. Under the PM's direction and guidance, the working group developed the CONOPS Document in February of 1997. This document describes all the functions currently provided by the Government to support the fleet. Thus, it identifies all the functions that could potentially be outsourced to a private contractor under the Fleet Management Concept. The scope of the M109 Fleet Management Pilot Program is still evolving and will not be finalized until next year. As a result, the CONOPS Document is often utilized as a baseline to evaluate the future concept against current requirements.

The CONOPS Document, which describes the total scope of program activities, is structurally organized like a WBS. In addition, the CONOPS Document is being utilized as a baseline to develop the program's actual WBS. Therefore, the CONOPS Document is an excellent risk management tool to assist in the assessment of the program's risks.

The Government often utilizes the WBS since ideally the WBS describes everything that will be done or delivered in a program. In addition, a WBS exhibits the following attributes that facilitate a thorough and accurate risk assessment: [Ref. 25:p. 20]

1. The WBS identifies in a structured form, all elements of the program in each phase, and provides a comprehensive framework for assessing each and every aspect of the program for potential risks.

2. The WBS provides traceability between performance requirements and risks.

3. The WBS illustrates the systems hierarchy and interfaces for the purpose of identifying risk dependencies and propagation.

4. The WBS can provide a single point-of-contact for each risk through the management structure.

Although it is not the program's actual WBS, the CONOPS Document can provide all the advantages listed above.

The CONOPS Document, shown in Appendix A, decomposes some fleet support activities down to the sixth level. However, the researcher only utilized the CONOPS Document down to the third level to conduct the risk assessment process. The researcher believes that decomposing the CONOPS down to the third level adequately categorizes the different risk events in sufficient detail. The summary CONOPS Document, utilized for the risk assessment process, is shown in Figure 4.1.

C. METHODOLOGY

The researcher utilized DSMC's methodology described in Chapter III to assess both the cost risks and performance risks associated with the program. The first part of the risk assessment process, identification, was accomplished through the use of surveys and interviews. First, the researcher, with the Deputy PM's assistance, identified several functional area experts in each of the four major areas of the CONOPS Document: Program Management, Logistical Support, System Technical Support, and Manufacturing/Maintenance. Second, four Risk Identification Surveys were developed; one for each of the major areas in the CONOPS Document. Once functional area experts were identified and contacted, the researcher sent a Risk Identification Survey to each expert. The functional area experts identified risk events in each of their areas of expertise, down to the third level of the CONOPS Document. Third, the researcher interviewed each expert regarding his/her responses to resolve any ambiguities. Finally, the researcher

1. M109 FOV Fleet Management CONOPS

- 1.1 Overall Program Management Oversight
  - 1.1.1 Contract Oversight
  - 1.1.2 General Management
  - 1.1.3 Requirements Determination (Top Level)
  - 1.1.4 Budget and Execution
  - 1.1.5 Long-term Planning
- 1.2 Fleet Logistical Support
  - 1.2.1 Item Management
  - 1.2.2 Physical Distribution Management
  - 1.2.3 Maintenance Management
  - 1.2.4 Facilities Planning Management
  - 1.2.5 Material Fielding
  - 1.2.6 Customer Support
  - 1.2.7 Collect Performance Data
- 1.3 System Technical Support
  - 1.3.1 Engineering
  - 1.3.2 Configuration/Change Management
  - 1.3.3 Test & Evaluation
  - 1.3.4. Product Improvement
  - 1.3.5 Customer Support
  - 1.3.6 Life Cycle Software Support
- 1.4 Manufacturing/Maintenance (for end item and secondary spares)
  - 1.4.1 Manufacturing
  - 1.4.2 Maintenance
  - 1.4.3 Modification/Conversions
  - 1.4.4 End Item and Secondary Item Repair/Overhaul

Figure 4.1. Summary CONOPS Document [Ref. 21, as modified by researcher]

consolidated all the risk events identified by the functional area experts into their respective CONOPS element. The consolidated list of risk events is shown in Appendix B - The M109 Fleet Management Risk Assessment Survey.

The second part of the risk assessment process, quantification, was also accomplished through the use of surveys and interviews. First, the researcher developed a risk

rating scheme built against an agreed set of definitions. This rating scheme helped to eliminate some of the ambiguities in quantifying each risk event. Second, the researcher, with the Deputy PM's assistance, identified a larger population of functional experts to respond to the Risk Assessment Survey in Appendix B. Functional area experts who responded to the Risk Identification Survey also responded to the Risk Assessment Survey. Third, the researcher took the data received from the Risk Assessment Survey and calculated the mean for each risk event for both cost and performance. This data was then graphically portrayed utilizing DSMC's Risk Rating Diagram discussed in Chapter III. Finally, the Risk Event Status (RES) was calculated for each risk event. Four Risk Watchlists were developed, one for each of the four major areas, rank-ordering the most severe risk events at the top with the relatively benign risk events at the bottom. The researcher used this methodology to quantify the risk events for each of the four main areas in the CONOPS Document.

The researcher received seven to nine assessment surveys from each of the four major areas. Some respondents assessed more than one area. However, most of the respondents assessed only one of the four major areas. Thus, there is limited significance in comparing assessment results across the major areas.

D. SURVEYS

1. Risk Identification Survey

Risk identification is one of the most critical elements in the risk assessment process since it identifies those areas which are perceived as being risky. Also, it provides the foundation for transforming qualitative information into quantitative information. [Ref. 7:p. 5-4] Since the M109 Fleet Management Program is unique, the researcher did not use the "analogy comparison" and "lessons learned technique" for risk identification. Rather, the researcher relied exclusively on expert judgment through the use of surveys and interviews. Thus, it was important for the researcher to identify the appropriate individuals to respond to the surveys. The Deputy PM identified three to four experts, in each of the four major areas of the CONOPS Document, to respond to the surveys. The Deputy PM selected these individuals based on his assessment of their technical knowledge and objectivity towards the program.

Surveys result in a collection of subjective judgments. People perceive risks differently and exhibit different levels for risk taking. For example, older people are generally perceived as being more risk adverse than younger people. Thus, there is no guarantee for assuring that the data collected is the best possible. The only real "error" in identifying the risks is in the methodology for collecting the data.

The researcher used the same methodology to decrease the subjectivity of this process. First, the researcher developed four surveys utilizing the summary CONOPS Document (Figure 4.1). Second, the researcher contacted all the functional area experts by phone to explain the purpose of the survey. Third, the researcher utilized the same cover letter instructing the survey population on how to correctly fill out the survey. Finally, the researcher interviewed each functional expert to ensure his/her input was accurately understood by the researcher.

2. Risk Assessment Survey

The main objective of the Risk Assessment Survey is to take the qualitative information derived from the Risk Identification Surveys and to transform this information into quantitative risk estimates for each risk event identified. The researcher attempted to quantify each risk event by calculating the RES for each risk event. As discussed in Chapter III, the RES was calculated by multiplying the Likelihood of Occurrence (LOO) by the Severity of Impact (SOI).

SOI for a program can be measured in terms of cost, schedule, and/or performance consequences. The primary reason for establishing a Fleet Manager is to save money while improving fleet support over the current system. Thus, the researcher only considered cost and performance risks. Although there are schedule risks involved with implementing the Fleet Management Concept, the main risks involved in the program will occur as a consequence of meeting cost and performance objectives. Also, unlike a new weapon system development, Fleet Management does not have the same critical schedule implications associated with fielding a new system. As a result, the researcher only assessed the SOI in terms of cost and performance to the fleet. The researcher calculated the combined impact of cost and performance by adding these two categories together. The average and standard deviation for LOO and SOI were calculated for each risk event. This data was used to develop the Risk Rating Diagram for each major area in the CONOPS Document. The RES for each risk event was calculated and a Risk Watch-list for each major CONOPS area was developed.

As discussed earlier, different people exhibit various levels and degrees for taking risks. It is common for two individuals to assess the same risk event differently. There are many factors that contribute to these differences: age, experience, knowledge, job position, job seniority, organizational assignment, personal involvement, etc. It is beyond the scope of this research to analyze the impact of these different factors. The researcher assigned equal weighting to each set of data, then consolidated the data to calculate the average LOO and SOI for each risk event.

The researcher attempted to create a baseline position by defining cost and performance consequences on a meaningful scale. This scale is based on the government's existing support system. Unfortunately, reliable cost and performance data for each CONOPS element were not available. As a result, the researcher developed a general scale that assessed the impact of the Fleet Manager's system to the Government's existing system without utilizing any distinct cost and/or performance data. The researcher utilized a 5-point scale for both Likelihood and Consequence to facilitate the assessment process. The Risk Assessment Survey Scale is shown in Figures 4.2a and 4.2b below.

LIKELIHOOD:

What is the likelihood the risk event will occur?	**Assessment/Rating**
Remote	1
Unlikely	2
Likely	3
Highly Likely	4
Nearly Certain	5

Figure 4.2a. The Risk Assessment Survey Scale [Ref. 4]

CONSEQUENCE: Given the risk is realized, what is the severity of impact?

Cost	**Assessment/ Rating**	**Performance/Technical**	**Assessment/ Rating**
Minimal or no impact - Budget Estimates not exceeded	1	Minimal impact to performance/readiness goals	1
Budget estimates slightly exceeded and/ or cost savings still realized over existing system	2	Acceptable with some reduction to margin/ baseline. Tech/Perf improvements still realized over existing system	2
Budget estimates exceeded. Minimal or no cost savings over existing system	3	Acceptable with significant reduction to margin/baseline. Minimal or no Tech/Perf improvement over existing system	3

Figure 4.2b. The Risk Assessment Survey Scale

Budget estimates exceeded. Actual cost exceeds existing systems cost	4	Acceptable with no remaining margin. Perf/Tech actually less than existing system	4
Budget estimates significantly exceeded. Actual cost greatly exceeds existing costs	5	Unacceptable - technical/ performance goals not met. Significant degrada-tion in performance compared to existing system	5

Source: Developed by Researcher.

Figure 4.2b. (Continued)

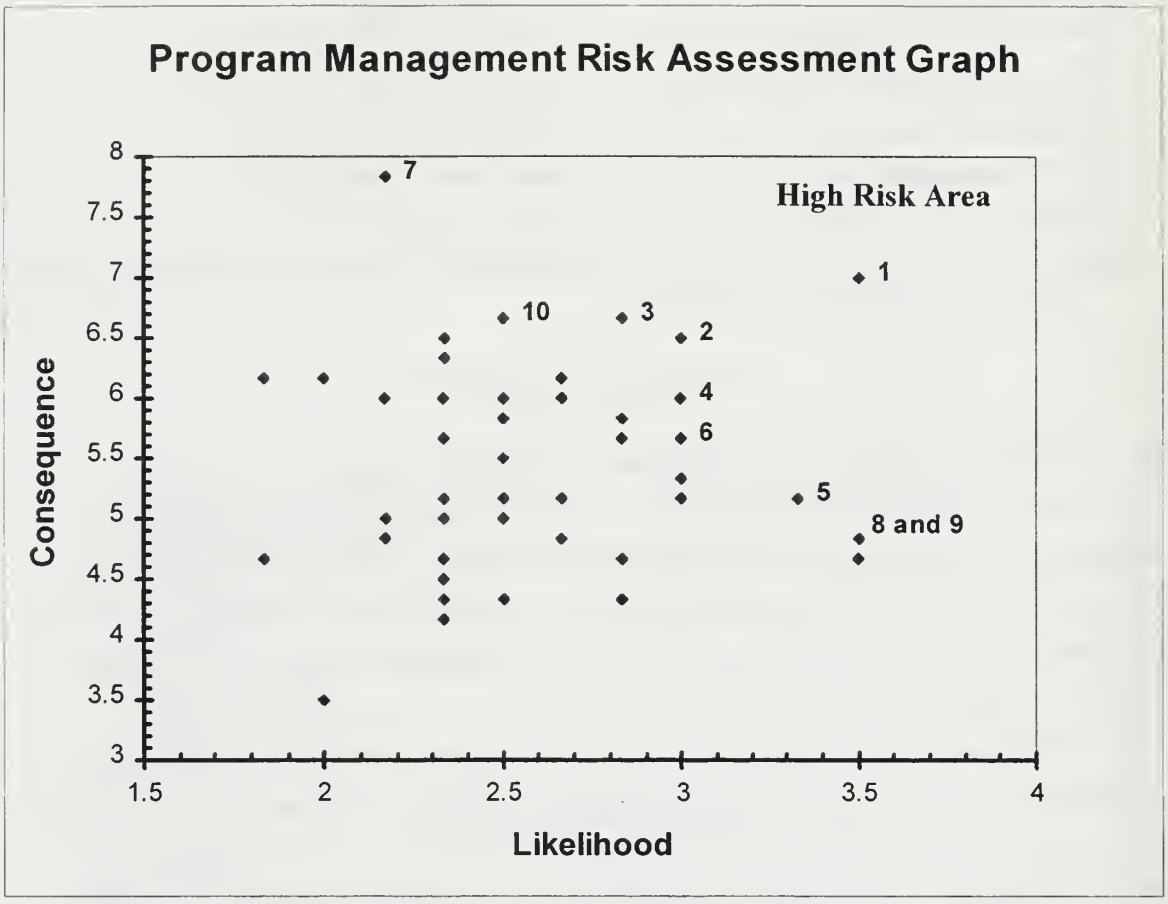
E. SURVEY RESULTS AND RISK WATCHLISTS

During the assessment process, the researcher assessed each major CONOPS area separately. In each area there were approximately thirty to fifty risk events identified. The complete rank-ordered list for the four major areas are listed in Appendix C. These four watchlists are not all inclusive and there are undoubtedly several risk events that have not been identified.

Many of the risk events were identified in several of the major CONOPS areas. For example, the risk event "Contractor on the Battlefield" was identified as a significant risk in three of the four major areas. In addition, many risk events were identified in several different elements within the same area. For example, the risk event "Organic Capability" was identified in all four third-level elements in the Maintenance/Manufacturing Area. In these particular cases, the researcher did not combine these risk events, but treated each potential event as a separate entity.

As previously discussed, the researcher assessed each of the four major areas in Fleet Management by developing separate Risk Assessment Graphs. Each point on the graph represents a different risk event and was determined by calculating the average LOO and SOI (Consequence) for each risk event. The points located in the upper right hand corner represent the high risk area. The researcher did not attempt to determine a break between high and low risk events. The researcher only labeled the "top-ten" risk events in each graph, which is common practice in many risk assessment methodologies. The numbers on the graph match the watchlist and represent the ten most severe risk events in that area. The watchlists, with their corresponding RES, are shown below each graph. The RES are used solely to prioritize the different risk events. These numbers do not correspond to actual cost or performance metrics.

1. **Program Management**



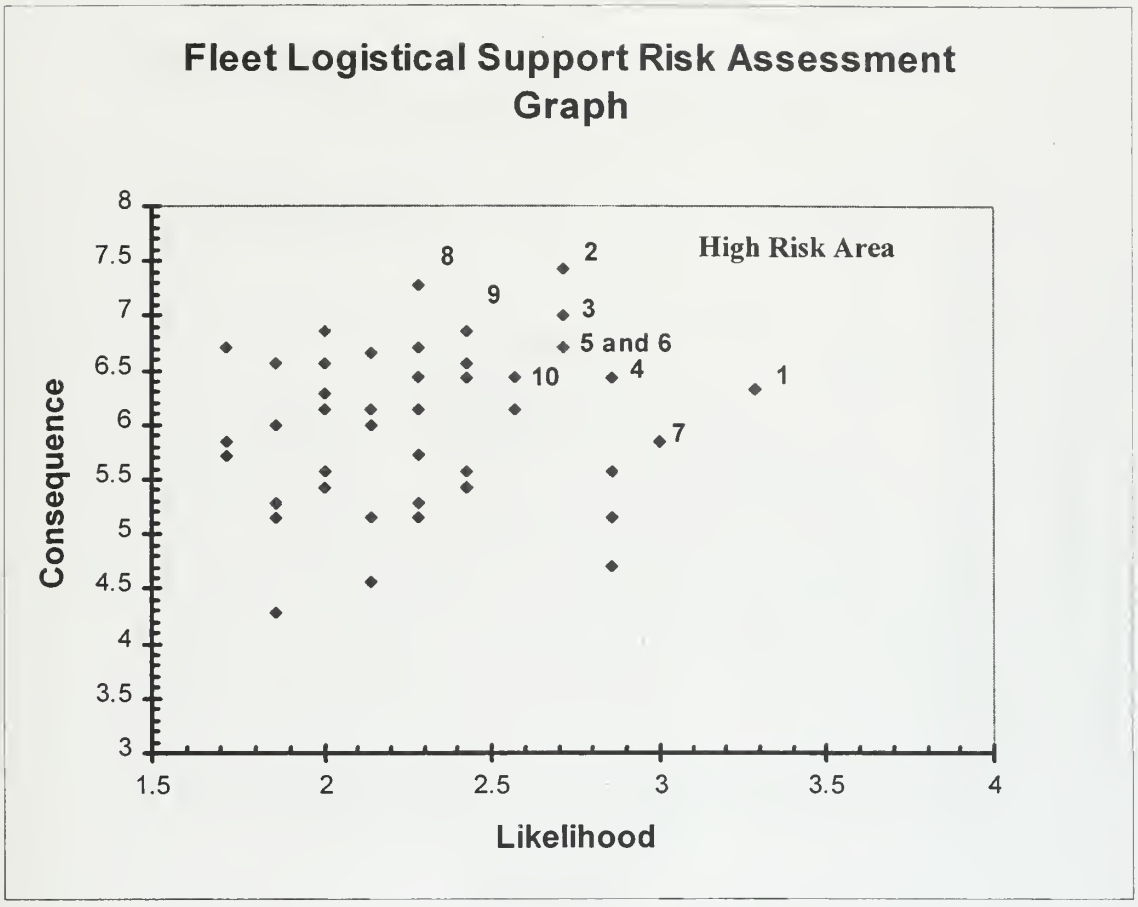
Program Management Risk Watchlist

Ranking	Risk Event	RES	Ranking	Risk Event	RES
1	Funding	24.5	6	Govt. Employee Resistance	17
2	Govt. Experience	19.5	7	Non-Performance by FM	16.97
3	Retention of Personnel	18.89	8	Unrealized Savings	16.91
4	Pricing	18	9	Organic Capability	16.91
5	Project Milestones	17.22	10	Transition Planning	16.67

Source: Developed by Researcher.

Figure 4.3. Program Management Risk Watchlist

2. **Fleet Logistical Support**



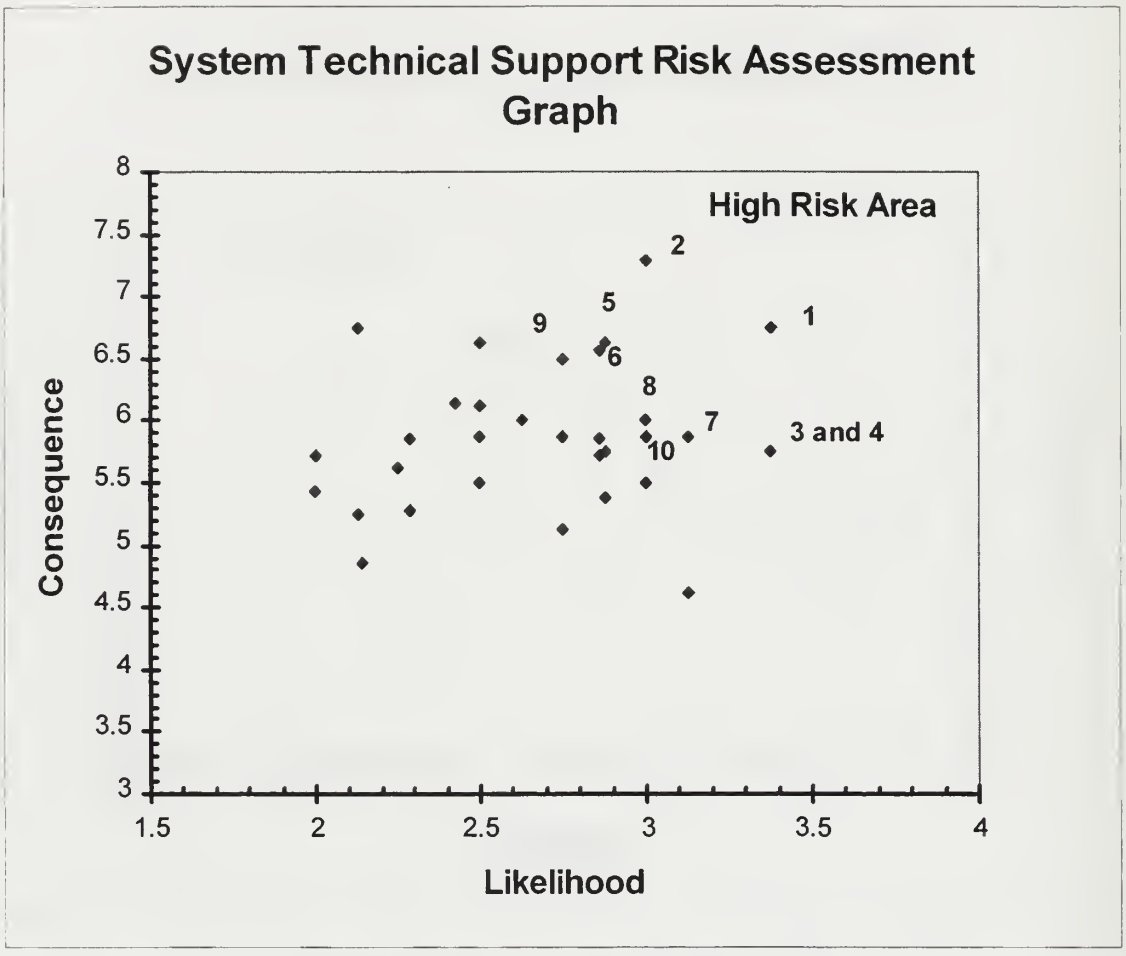
Fleet Logistical Support Risk Watchlist

Ranking	Risk Event	RES	Ranking	Risk Event	RES
1	FM Baseline Change	20.81	6	Contractor on the Battlefield	18.22
2	Contractor on the Battlefield	20.16	7	Govt. Changes - Down-sizing	17.57
3	Transition Planning	19	8	Deployed Operations	16.65
4	Parts Inventory Management	18.37	9	Repair Parts Availability	16.65
5	Scope of Parts Supply	18.22	10	Disposition of Inventory and Contingency Response	16.53

Note: Risk #2 and #6, Contractor on the Battlefield, was identified in CONOPS Element 1.2.3 - Maintenance and 1.2.6 - Customer Support respectively.
Source: Developed by Researcher.

Figure 4.4. Fleet Logistical Support Risk Watchlist

3. System Technical Support



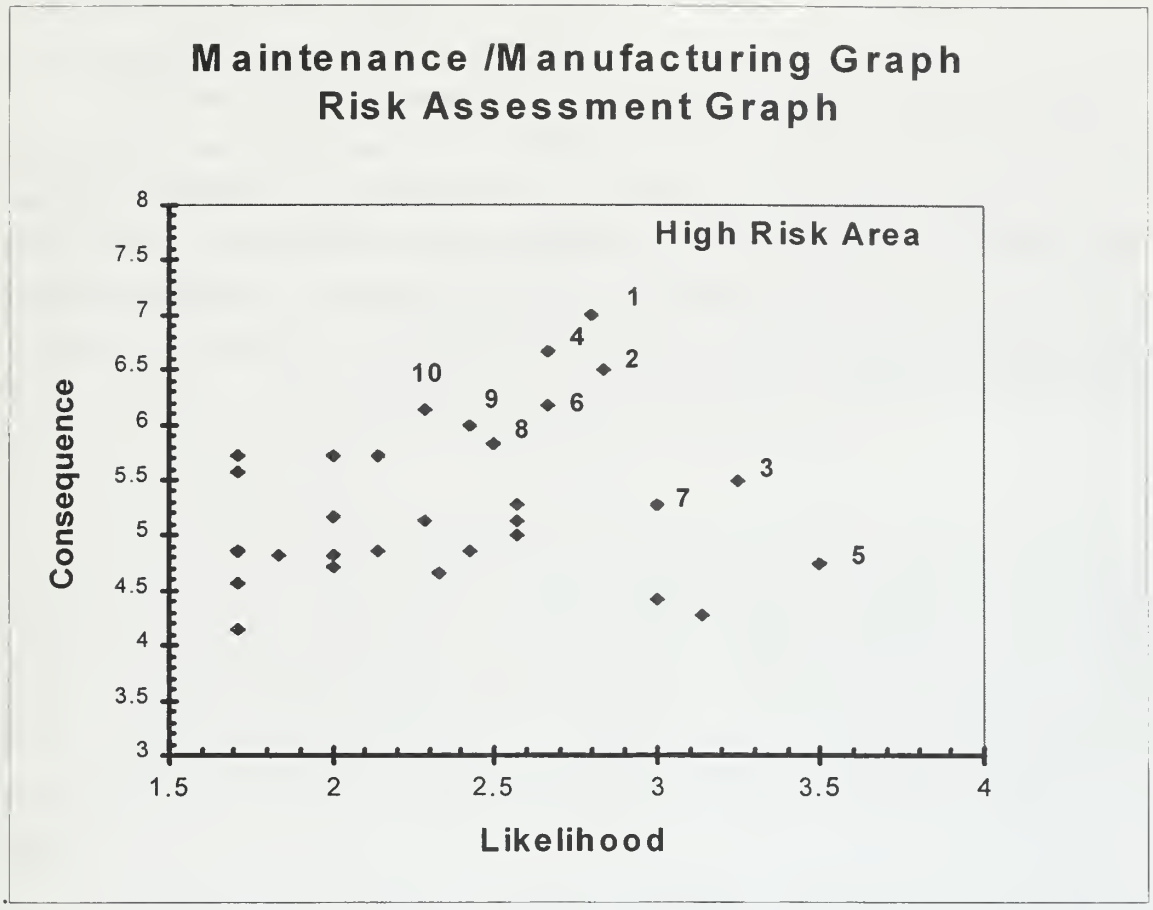
System Technical Support Risk Watchlist

Ranking	Risk Rating	RES	Ranking	Risk Rating	RES
1	Lack of Incentive by FM	22.78	6	Technical/Functional Experts	18.78
2	Contractor on the Battlefield	21.85	7	Unnecessary Changes	18.36
3	Funding	19.41	8	Modernization Thru Spares	18
4	Program History & Lessons Learned	19.4	9	Interoperability	17.88
5	Objectivity of FM Conducting Test	19.05	10	TDP Changes	17.62

Note: Since CONOPS Element 1.3.6 - Software Support will be performed by the Government, the researcher did not include software risks in the assessment.
Source: Developed by Researcher.

Figure 4.5. System Technical Support Risk Watchlist

4. Maintenance/Manufacturing



Maintenance/Manufacturing Risk Watchlist

Ranking	Risk Event	RES	Ranking	Risk Event	RES
1	Contractor on the Battlefield	19.6	6	Deployed Operations	16.44
2	Contractor on the Battlefield	18.42	7	Commercial Business Practices	15.86
3	Organic Capability	17.87	8	Automated Maintenance Tools	14.58
4	Contractor on the Battlefield	17.77	9	Technical Data	14.57
5	Organic Capability	16.63	10	Labor/Mngt Disputes	14.04

Note: Risk #1, #2, and #4, Contractor on the Battlefield, was identified in CONOPS Element 1.4.2 - Maintenance, 1.4.4 - End Item and Secondary Repair/Overhaul, and 1.4.3 - Modifications and Conversions respectively. Risk #3 and #5, Organic Capability, was identified in CONOPS Element 1.4.3 - Modifications and Conversions and 1.4.1 - Manufacturing respectively.
Source: Developed by Researcher.

Figure 4.6. Maintenance/Manufacturing Risk Watchlist

F. SUMMARY

The risk assessment process is necessary in providing a structure for identifying and ranking the different risk events in the program. For Fleet Management, the total system evaluation was facilitated by the CONOPS Document which provided a framework for organizing the risk events. The rating scheme in the surveys helped to eliminate some of the ambiguities in the assessment process and provided a framework for evaluating and quantifying the risks identified. The watchlist in each major area provided the program with preliminary prioritization of the risks for further evaluation. In the next chapter, the researcher will utilize the watchlists to analyze the impact the different risk events have on the program.

V. RISK ANALYSIS

A. PURPOSE

This chapter discusses the methodology and results of the risk analysis process. The transition from risk assessment activities (Chapter IV) to risk analysis activities is usually very gradual. Tasks that are normally considered analysis activities are often conducted during the assessment phase and vice-versa. [Ref. 7:p. 4-8] For example, the researcher developed a preliminary watchlist in the assessment phase which is traditionally developed in the analysis phase. Now, in the analysis phase, the researcher will utilize this watchlist to determine the high risk elements in the CONOPS Document and the potential impact these risk events can have on the program.

B. METHODOLOGY

The ultimate purpose of risk management is risk mitigation, which is the act of revising either the scope, budget, quality, and/or schedule so that the project's uncertainty is reduced without any significant impact on objectives. Risk mitigation requires analysis in order to determine what impact these uncertainties have on the program. [Ref. 15:p. 890] The researcher accomplished this by applying the watchlist developed in Chapter IV against the total program to determine the various degrees of risk throughout the program.

The researcher used a graphical analysis technique by portraying the risks on an WBS-organizational chart. The researcher developed four risk charts from the CONOPS Document which graphically depict the risks by utilizing the watchlist developed in Chapter IV. The first and second level in the risk charts correspond to the first and second level of the CONOPS Document. The third level is a hierarchical lists of all the risk events identified in each of the CONOPS elements. This level will list each risk event in descending order according to its RES value.

The researcher developed a simple risk rating scale to categorized each risk event as either high, medium, or low. To develop this scale, the researcher divided the range of all the RES values into the three categories. The High Risk category corresponds to the Top Ten Risk Event List developed in Chapter IV. Since there was no discernible break between the medium and low risk categories, the researcher categorized the bottom ten risk events as the Low Risk category. Thus, the remaining risk events were grouped into the Medium Risk category and were designated as an area of concern for the PM.

The researcher will analyze each third-level element in the risk chart by applying the risk rating scale. Analysis will focus on those elements that exhibit the greatest risk according to the scale. This rating scale will graphically depict the high, medium, and low risk areas for Fleet Management.

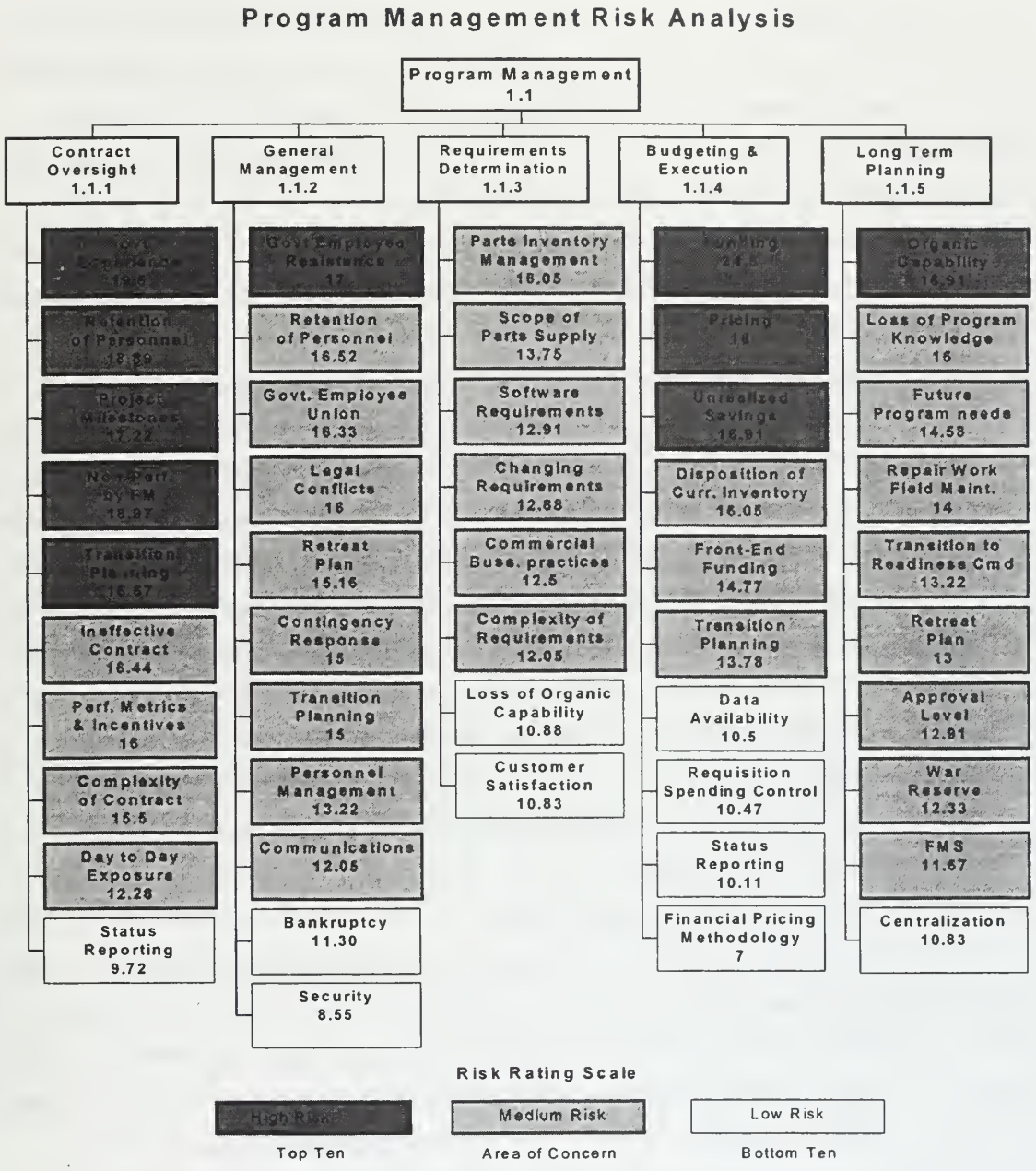
As discussed in Chapter IV, people perceive risks differently and exhibit various comfort levels for risk taking. In the assessment phase, most of the surveys the researcher received were from functional experts/managers who only assessed an area that pertained to their specialty. As a result, the researcher will analyze each risk chart as a separate entity and will not compare the various risk categories across the four major areas of the CONOPS Document.

C. PROGRAM MANAGEMENT RISK CHART

One general conclusion that is readily apparent shown in Figure 5.1 is the high degree of risk associated with Contract Oversight. Budgeting & Execution, which contains the highest risk event in the Program Management Area, exhibits the next highest degree of risk. Budgeting & Execution is followed by General Management and Long Term Planning, which display a relatively equal amount of risk. Finally, Requirements Determination exhibits the least amount of risk in the Program Management area.

1. Contract Oversight - 1.1.1

The complexity and scope of the contract makes Contract Oversight the highest risk element in this area. As previously stated, Fleet Management is a new and untested concept. The Government has limited experience and institutional knowledge in managing a contract of this size and scope. Unlike many programs within DoD, the PM can not draw on past lessons-learned from other program offices to reduce uncertainties and the subsequent mistakes that usually occur when executing a new concept. The PM has to decide which functional specialists are necessary to provide the appropriate level of knowledge and oversight for the contract. Too much oversight will reduce potential savings and innovation. On the other hand, the PM still needs to retain the right personnel to maintain a base level of knowledge and experience over the program. The ultimate responsibility remains with the Government, and, as with any contracted effort, the acceptance of the work still remains with the Government. Thus, the Government needs to retain qualified personnel in both technical and management areas to execute the program.



Source: Developed by Researcher.

Figure 5.1. Program Management Risk Chart

Transition Planning is critical to implementing Fleet Management across DoD. Currently, there are multiple commands/agencies that perform services for the M109 FOV. The Program Office is responsible to ensure all Government agencies coordinate

with the Fleet Manager on a synchronized transition schedule. Ineffective Transition Planning will reduce the Fleet Manager's effectiveness and will result in missing critical project milestones. Missed milestones in any one area or agency could have multiple effects on other areas and/or agencies. This will ultimately detract from the potential benefits sought from the Fleet Management Concept.

Unfavorable business conditions could result in Non-performance by the Fleet Manager. The Fleet Manager's ultimate goal is to make a profit. If market conditions cannot support this goal, the Fleet Manager might be forced to change its strategy and reorganize. In addition, companies are bought and sold on a daily basis. If the Fleet Manager is taken-over by another company, who is to say that the new company will perform or care as much as the old company? In this situation, a corporate buy-out could have a significant impact on the Fleet Manager's performance.

Although not in the top ten, Ineffective Contract Structure and Performance Metrics and Incentives can have a significant impact on the Fleet Manager's performance. The Government needs to ensure an effective contract structure is crafted that provides the appropriate incentives to encourage the Fleet Manager to perform. These incentives should be tied to performance metrics that save the Government money while improving the life-cycle support of the fleet. As a result, the Government needs to establish and monitor the correct performance metrics that will motivate the contractor to operate as efficiently and effectively as possible.

2. Budget and Execution - 1.1.4

The next highest concentration of risks occurs in Budgeting and Execution. It's not surprising that Funding received the highest RES score of all the risks identified. Funding constraints are a major risk in virtually all DoD programs. Conceptually, Fleet Management should save the Government millions of dollars each year. However, these projected savings are long-term. Initially, Fleet Management will cost a substantial amount of money to implement, and savings probably will not occur for several years . Under the current fiscal environment, setting aside additional money to fund a new program could be quite difficult.

Another major concern for the Government is the Fleet Manager's pricing methodology on parts and services. The Government must have some control over pricing to keep prices stable and consistent. Army units need consistent and affordable prices in order to properly budget and forecast parts and services. The Fleet Manager must determine the correct price for parts and services that will enable it to make a profit,

while still achieving the program's objectives for cost savings and performance improvements.

Under the Fleet Management Concept, the Fleet Manager should save the Government millions annually by utilizing best business practices. Some projections estimate savings up to 30%. If savings of this scale are not realized in a reasonable amount of time, support for the Fleet Management Concept will probably decline. This situation could have a negative impact on future program funding.

3. General Management - 1.1.2

General Management also exhibits a relatively high degree of risk. The highest risk, Government Employee Resistance, will be very hard to predict. People usually do not like change, especially when the change can influence retaining their job. Fleet Management is a tremendous shift away from the status-quo and requires a cultural change on the part of the Government. Cultural changes do not occur overnight, even in the best organizations. Thus, we can expect some resistance to working with the Fleet Manager on the part of Government employees. This resistance will have an impact on the transition process and could affect potential savings.

Government Employee Unions oppose most outsourcing initiatives since they will usually reduce the number of jobs available for their members. Although the M109 Fleet Management Program will have limited effect on the amount of work available, the Unions are concerned that subsequent Fleet Management Programs will substantially affect the amount of work available for its members in the future. [Ref. 19:p. 24] As a result, it is likely that the unions will not fully cooperate with implementing Fleet Management. Thus, legal conflicts are likely to develop. Many of these legal conflicts, which address retention of core work within the Government, will delay Fleet Management implementation and could reduce potential savings.

4. Long-Term Planning - 1.1.5

Long-Term Planning requires that the planners have intimate knowledge of the systems, their problems, and their potential solutions. Initially, the Fleet Manager will possess limited knowledge and expertise concerning the fleet. As a result, it will be difficult for the Fleet Manager to make informed decisions that affect long-term planning. This could have a significant impact on achieving cost and performance objectives. Fleet Management will require the Government to transfer most of its organic technical functions to the Fleet Manager. Without this organic capability, the Government's ability to make informed decisions will also become limited. In addition, the loss of program

knowledge and technical interface by the Government, will also inhibit Government long-term planning.

5. Requirements Determination - 1.1.3

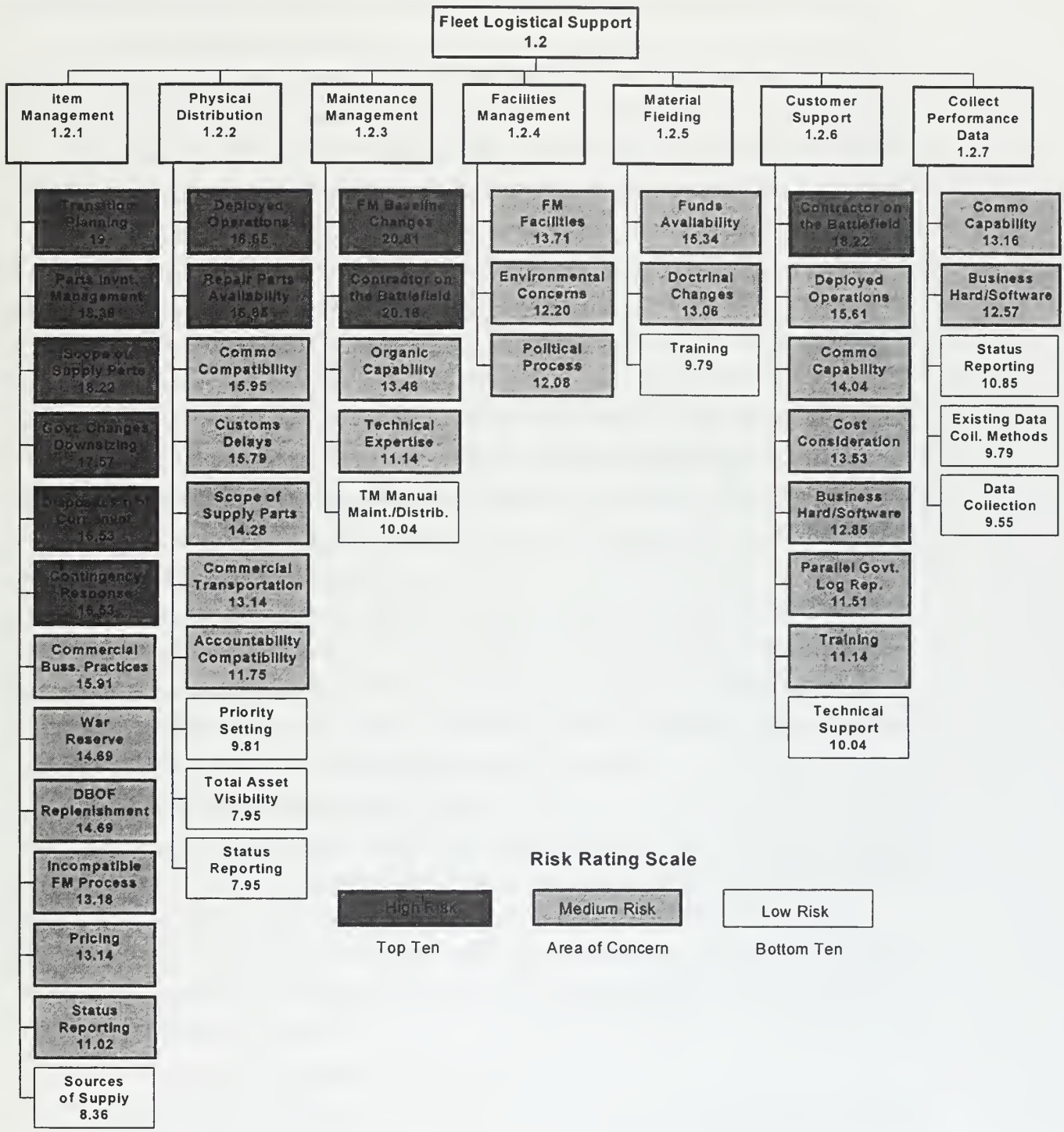
Conceptually, Government and Fleet Manager interfaces should reduce the uncertainty involved in Requirements Determination. During the transition process, the Government will transfer historical data to the Fleet Manager that will enable the Fleet Manager to adequately define requirements. As a result, the perceived risks in this area are less. However, due to the scope and complexity of the Fleet Management Concept, there are issues regarding parts ownership, obsolescence, surpluses, stock levels, and inter-operability that must be resolved to achieve cost objectives. In addition, the Fleet Manager must be able to respond to changing requirements on a daily basis. If the Government is constrained in its ability to respond by contractual limitations, the performance of the fleet will be affected.

D. FLEET LOGISTICAL SUPPORT RISK CHART

It is evident from Figure 5.2 that Item Management functions present the greatest risk in the Fleet Logistical Support area. Physical Distribution, which is the second highest risk element, also displays a relatively high degree of risk. Maintenance Management and Customer Support are the third and fourth highest risk elements respectively and exhibit a moderate degree of risk. The remaining elements, Facilities Management, Material Fielding, and Collect Performance Data exhibit a low degree of risk in this area.

1. Item Management - 1.2.1

One reason for the high degree of risk associated with this element are all the functions performed under Item Management. The CONOPS Document in Appendix A shows all the functions associated with Item Management. These functions include procurement, cataloging, repair, priority, distribution, and disposal. As a result, it is not surprising that numerous risks were identified under this element. According to a preliminary cost/benefit analysis, the Fleet Manager is projected to generate the greatest amount of savings under Item Management. However, these potential savings are not without numerous risks. First, as previously stated, transition planning is critical to implementing Fleet Management. Under the best conditions, the Government should still anticipate unplanned contingencies that could delay implementation.



Source: Developed by Researcher.

Figure 5.2. Fleet Logistical Support Risk Chart

Currently, there are over 4000 M109 unique parts worth over $120 million. The Government must transfer control of this inventory to the Fleet Manager and support the fleet at the same time. Unfortunately, there are still many issues regarding Parts Inventory Management. For example, how much control will the Government transfer to the Fleet Manager regarding stock levels and location of stock? More Governmental control will probably results in less cost savings. There are also many questions concerning the range of supply parts provided by the Fleet Manager. Should the Fleet Manager provide all unique and common M109 parts, just M109 unique parts, or just critical parts? Each variation presents various risks that will require the Fleet Manager to implement a different approach to satisfy the requirement. Uncertainty in the disposition of obsolete parts will also affect potential cost savings. Finally, there is also concern over whether the Fleet Manager can respond rapidly to contingencies. Again, the Government cannot be constrained by contractual limitations in its ability to respond to contingencies.

2. Physical Distribution - 1.2.2

Physical Distribution exhibits the next highest degree of risk in Fleet Logistical Support since it contains the second largest number of High and Medium Risks. The Fleet Manager must be able to provide responsive support to deployed Army units. This situation presents many risks involving communication, safety, and transportation. Direct delivery of parts using commercial vendors may not be practical in certain parts of the world. As a result, the Fleet Manager and the Government will have to use alternate means to deliver parts and services which would probably lower potential savings.

There are also questions concerning the availability of repair parts. The Fleet Manager will be required to coordinate and establish business relationships with numerous vendors. Accomplishing these tasks takes time. As a result, it is unlikely that the Fleet Manager will have control over all the factors in its procurement operations.

Although not in the top-ten, Communication Capability presents many challenges to the Fleet Manager. Conceptually, the Fleet Manager is expected to communicate with units using internet technology that is compatible with the Army Technical Architecture. Unfortunately, not all deployed units have access to the internet. In addition, current Unit Level Logistics System (ULLS) hardware and software are not compatible with internet technology. [Ref. 19:p. 7] As a result, the Government will be forced to procure additional equipment to establish a direct link between the user and the Fleet Manager.

3. Maintenance Management - 1.2.3

Maintenance Management is also considered a high risk element since it contains two very high risk events. First, changing requirements could affect the Fleet Manager's

baseline for both services and personnel requirements. Unanticipated user requirements could result in unplanned expenses which would have an impact on projected savings. Second, the Fleet Manager is expected to provide the necessary expertise and information to maintain fielded systems throughout their life cycle. This will require the Fleet Manager to provide support to deployed units in war zones. The availability of support in this situation is uncertain and will depend on the perceived threat. High threat situations will likely limit support and could have a severe impact on performance.

4. Customer Support - 1.2.6

Survey results indicate that the Fleet Manager should provide adequate Customer Support during peacetime. However, in a hostile environment, the Fleet Manager will be limited in its ability to perform Customer Support functions. It is unlikely that the Fleet Manager will be as responsive in war zones as in a secure environment. This will affect the Fleet Manager's ability to provide technical and administrative support to its customers. In addition, the inability of the Fleet Manager to establish communications with deployed units will impact on Customer Support. Although these issues sound serious, the perceived risk in this area from the surveys still appears to be moderate.

5. Material Fielding - 1.2.5

The surveys only identified three risk events for this element. One reason could be the controlled environment in which new equipment is usually fielded. However, there are issues concerning Funding and Doctrinal Changes that could affect the Fleet Manager's ability to properly field a new piece of equipment. As a result, the researcher considers Material Fielding to be a moderate to low risk element.

6. Facilities Management - 1.2.4

Facilities Management displays a relatively small amount of risk. Again, the controlled environment in which these activities occur could account for this assessment. There are issues regarding the physical building and equipment required by the Fleet Manager to maintain and store equipment. Fortunately, most of these concerns should be mitigated through the source selection process. As a result, Facilities Management is considered a low risk element.

7. Collect Performance Data - 1.2.6

Although this element contains five different risk events, most of these risk events were assessed in the Low Risk category. One explanation could be the lack of complexity involved in performing this function. Also, it is generally assumed that the Fleet Manager will have access to applicable Government data bases and that Sample

Data Collection activities will not change. Thus, Collect Performance Data is considered a low risk element.

E. SYSTEM TECHNICAL SUPPORT RISK CHART

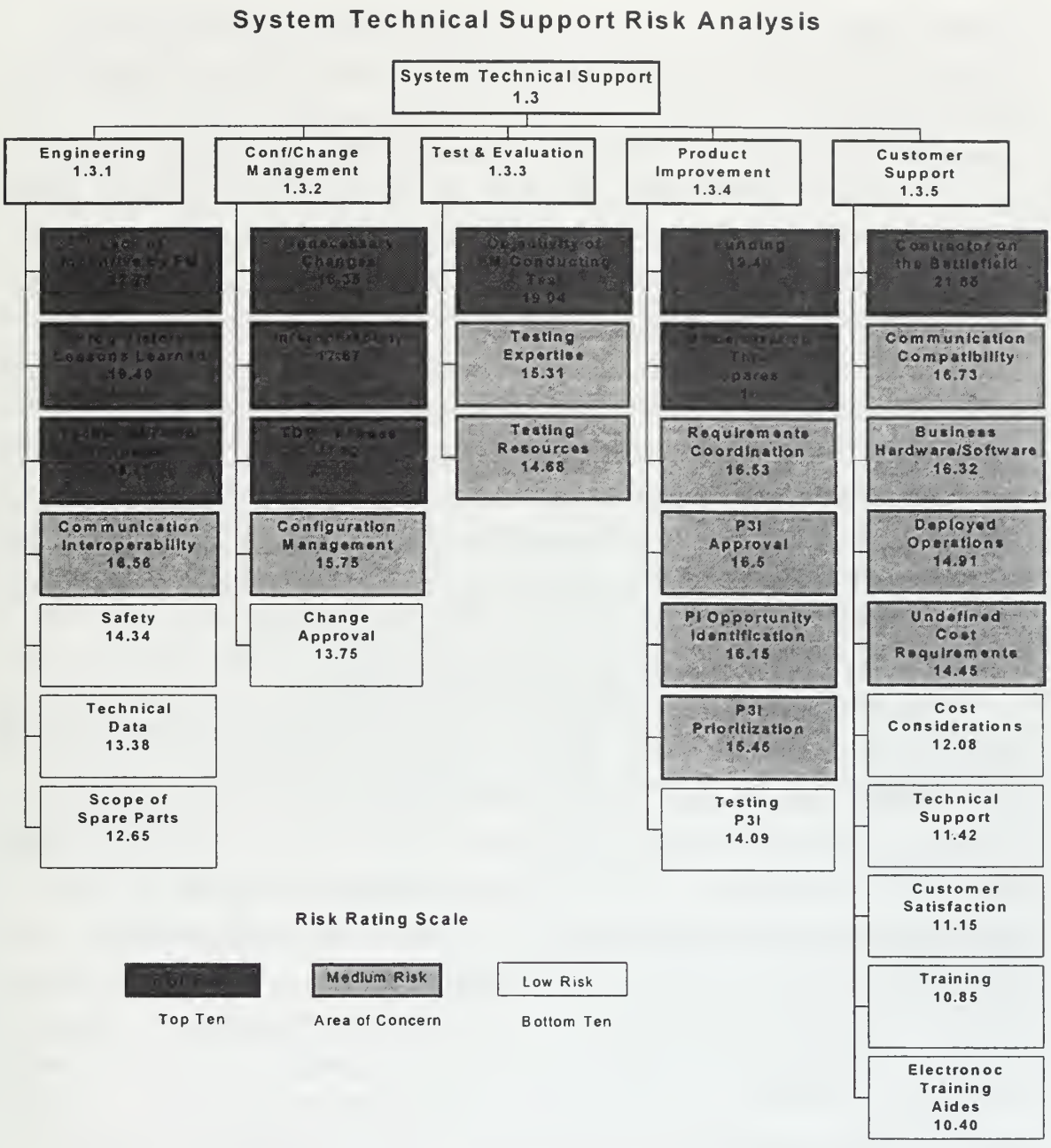
Compared to Figure 5.1 and Figure 5.2, the High and Medium Risk Events in Figure 5.3 appear to be more evenly distributed throughout the different elements in System Technical Support. Engineering, Product Improvement, and Configuration/Change Management all exhibit a relatively high degree of risk. Customer Support displays a high-to-moderate degree of risk due to the number of Medium Risk Events. Finally, Test & Evaluation displays the least amount of risk in the System Technical Support area.

1. Engineering - 1.3.1

Survey results indicate a high degree of risk in this area. This is not surprising due to the wide range of activities included in this element. The Fleet Manager is expected to establish a broad-based technical capability that will provide for all technical activities needed for life-cycle support. To accomplish this, the Fleet Manager is expected to implement innovative approaches that will improve reliability, maintain-ability, and performance. However, there appears to be little incentive for the Fleet Manager to improve engineering functions when he is also making a profit on selling spare parts.

The Fleet Manager must acquire the technical expertise in many functional disciplines such as: cannon technology, explosives, hydraulics, fire control, and armament. Functional expertise in these areas is not readily-available in commercial industry and takes time to assimilate. In addition, the Fleet Manager will most likely have limited knowledge of the program's history and lessons-learned. These factors could have an impact on the Fleet Manager's ability to implement the numerous engineering functions that are necessary to achieve performance objectives.

Communications interoperability is a critical requirement for Force XXI. The Fleet Manager must be able to design for communication interoperability between all systems on the battlefield. This will require a tremendous amount of knowledge and expertise on the part of the Fleet Manager regarding other battlefield operating systems. If the Fleet Manager doesn't have this knowledge, communications with other systems will not occur which could degrade combat effectiveness.



Source: Developed by Researcher.

Figure 5.3. System Technical Support Risk Chart

2. Product Improvement - 1.3.4

Funding uncertainties make Product Improvement a high risk element. The Fleet Manager is expected to implement new products and processes that will improve weapon system performance. Again, funding uncertainties can negatively impact the Fleet

Manager's ability to field new products. These constraints could affect performance objectives. The Fleet Manager is expected to modernize spare parts by providing better performing and more cost-effective spare parts from its vendors. Presently, the Government has difficulty achieving this objective due to the large number of vendors and parts. Initially, the Fleet Manager could experience similar problems which could impact on cost and performance data. Fielding new products will likely change requirements for parts and services. This will require additional unplanned coordination which could affect potential savings.

The Fleet Manager is expected to stay abreast of all new developmental activities within DoD and industry in order to identify new opportunities for product improvements. Identifying all possible product improvement opportunities will require a large research effort by the Fleet Manager which could detract from projected savings. The Fleet Manager must also receive approval from the Government to buy new products and services. This requires close coordination and a shared understanding of all objectives and constraints between the Government and the Fleet Manager.

3. Configuration/Change Management - 1.3.2

Sound configuration management procedures are critical for ensuring accurate and up-to-date technical data packages (TDPs). On the surface, these procedures do not appear to be difficult. However, the surveys indicate that there are several High Risk Events associated with performing these activities. As the sole provider of M109-unique parts, the Fleet Manager will control configuration tracking and change management. Thus, the transition of this function from the Government to the Fleet Manager is critical. Incompatible Configuration Management processes could have an impact on a TDP's accuracy which could affect performance. If the Fleet Manager is not familiar with all the TDPs, the Fleet Manager might generate unnecessary changes which would degrade cost savings. In addition, the Fleet Manager could inadvertently make changes to TDPs that could affect interoperability of parts between systems. This situation would affect the fleet's performance and would require additional TDP redesign. Finally, the Fleet Manager would have the ability to make TDP changes that could limit or prevent future competition. This would give the current Fleet Manager tremendous leverage over the Government when competing subsequent contracts. Thus, particular attention should be paid to how configuration changes are approved and to the membership of the Configuration Control Board.

4. Customer Support - 1.3.5

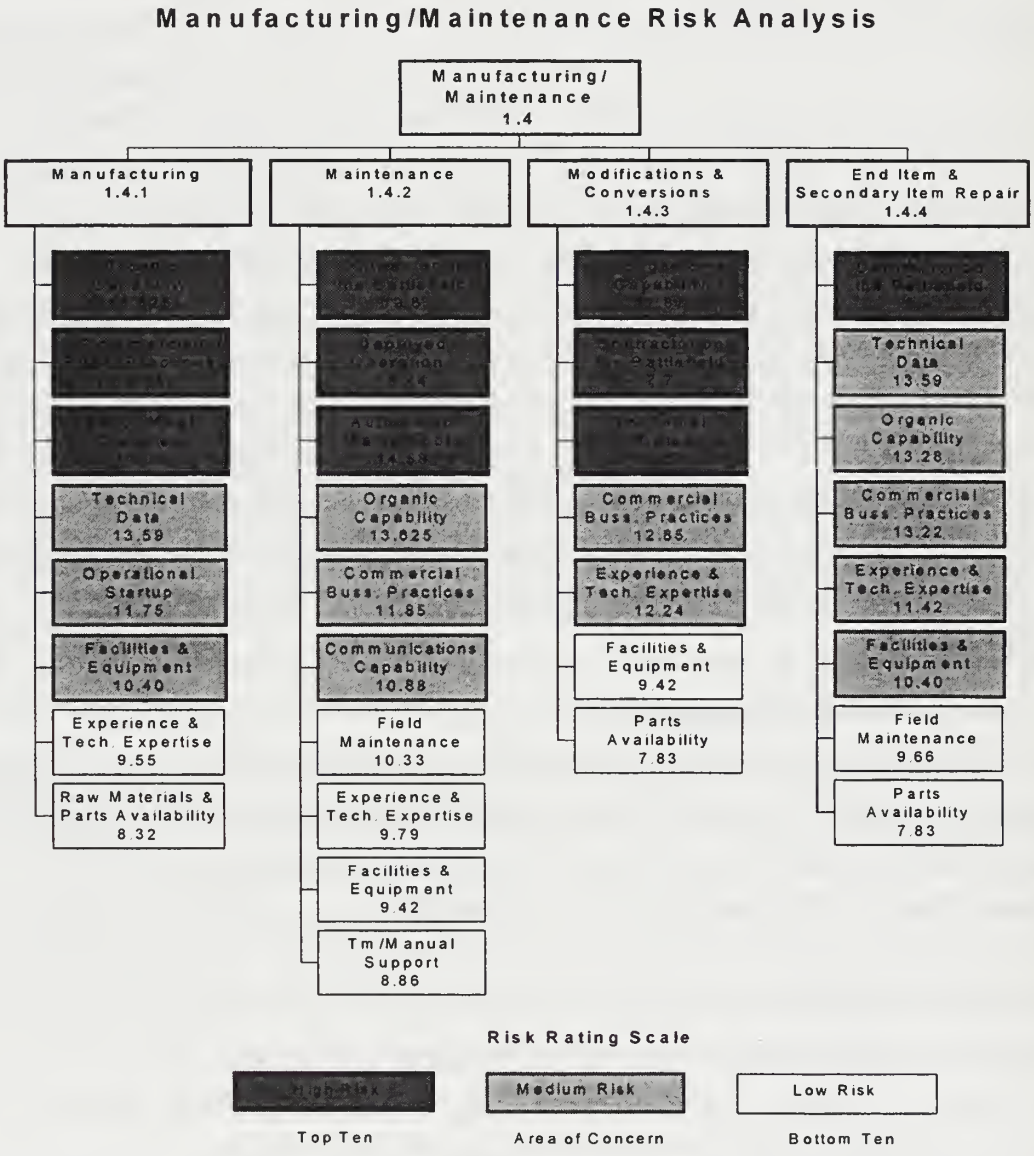
Due to the number of Medium Risk Events, Customer Support is considered a high to moderate risk element. Contractor on the battlefield is a recurring risk event that affects numerous CONOPS Elements. Again, it is nearly impossible to measure the impact of this risk on performance; however, it is likely that the Fleet Manager's customer support operations will be affected. In order to provide adequate support to its customers, the Fleet Manager must establish direct communications with its customers worldwide. Unfortunately, there are many Army units, particularly those deployed, who do not have access to internet technology. In addition, current use of the Standard Army Management Information System (STAMIS) loses many of the advantages of a direct link between the Fleet Manager and its customers which could negatively impact on Fleet Management performance objectives. [Ref. 19:p. 7] To correct this problem, two alternatives exist. First, hardware and software modifications can be made to existing systems. Many people favor this solution since only one computer is required; however, the ability to upgrade capability will probably be reduced. The second solution requires the acquisition of a laptop computer based system. Purchasing new systems will result in significant procurement, fielding, and training expenses. Regardless of which option is selected, hardware and software changes are needed to establish a direct link between the Fleet Manager and its customers. This expense could have a substantial impact on projected savings.

5. Test & Evaluation - 1.3.3

Test & Evaluation exhibits the least amount of risk in this area and is considered a moderate risk element. One reason could be the controlled nature in which Testing and Evaluations are conducted. Nevertheless, there are several issues that should be addressed. First, the Fleet Manager will be responsible to plan, coordinate, and manage the conduct of all testing. To achieve performance objectives, the Fleet Manager must conduct these tests in an objective manner. However, if the Fleet Manager designs, tests, and approves the configuration, there are opportunities for the Fleet Manager to conduct inefficient and ineffective tests which could impact on cost and performance objectives. In addition, there is concern over the Fleet Manager's ability to obtain the expertise and resources necessary to conduct Test & Evaluations correctly.

F. MANUFACTURING/MAINTENANCE RISK CHART

Similar to the System Technical Support Risk Chart, Manufacturing/Maintenance risk categories are widely-distributed throughout all of the elements (See Figure 5.4).



Source: Developed by Researcher.

Figure 5.4. Manufacturing/Maintenance Risk Chart

Due to the degree and number of High Risk Events, Maintenance appears to be the highest risk element in this area. Maintenance is closely followed by both Manufacturing and Modifications & Conversions, which exhibit a relatively equal amount of risk. Finally, End Item & Secondary Item Repair exhibits the least amount of risk in this area. A more interesting observation is that most of the risk events were identified in several of the elements. For example, Organic Capability, Commercial Business Practices, Technical Data, Contractor on the Battlefield, Facilities & Equipment, and Experience & Technical Expertise were identified in at least three of the four elements. One reason for the recurring risk events is the similarity of the functions performed in each of these elements.

1. Maintenance - 1.4.2

Due to the variety of maintenance activities required by the Fleet Manager, Maintenance presents the greatest amount of uncertainty in this area. The Fleet Manager is expected to provide service representatives at the field level to support Army unit-level maintenance activities. Maintenance support must be continuous: in peace-time and in war, for CONUS-based units, and for deployed units. As previously discussed, there are a lot of uncertainties involved during times of war which are hard to measure. Also, the Government needs to define the level at which the Fleet Manager will support unit-level maintenance functions. If the Fleet Manager is only present at the Main Support Battalion (division-level), it is unlikely that support will be very responsive at the battery/battalion-level.

The Fleet Manager is expected to deploy with units to remote areas. In these situations, the Fleet Manager might not have access to maintenance tools and equipment. Also, conventional transportation of repair parts may not be available to remote areas. In these cases, the Fleet Manager would have to develop alternate plans for providing maintenance support which could impact on cost objectives. Finally, the surveys indicate that the Government will assume risk by losing high echelon maintenance expertise.

2. Modification & Conversions - 1.4.3

Modification & Conversions possess a high degree of risk for many of the same reasons stated above. However, due to the scope of the activities involved in this element, the perceived risk appears to be slightly lower than in Maintenance. The Fleet Manager must have the capability to alter and upgrade existing systems regardless of location. First, the Fleet Manager must have the appropriate expertise to perform modifications and conversions. Initially, it is unlikely that the Fleet Manager will have the unique weapon system expertise in all functional disciplines. As a result, the

Government will be forced to help the Fleet Manager develop this expertise. Once the Government transfers this expertise to the Fleet Manager, the Government now faces the risk of not having the required program knowledge and expertise that is needed for decision making and contingencies. Second, the Fleet Manager might be required to perform upgrades and modifications in war zones. Many of the issues concerning the Contractor on the Battlefield risk event have already been discussed and still apply.

3. Manufacturing - 1.4.1

Manufacturing is a high risk element and appears to exhibit the same degree of risk as Modification & Conversions. Although Manufacturing activities occur in a relatively secure environment, these activities can be affected by other external factors. For example, Labor/Management disputes can delay production schedules and fielding timelines. Also, there are many uncertainties involved in acquiring the necessary Organic Capability needed to manufacture end items and secondary items. The Organic Capability issues addressed in Modifications & Conversions also apply to Manufacturing.

4. End Item & Secondary Item Repair - 1.4.4

End Item & Secondary Item Repair exhibits the least amount of risk on the risk chart. One reason for the lower perceived risk could be the limited scope of activities included in this area. Presently, the depots perform much of this work and it is unlikely that the depots will turn over these activities to the Fleet Manager. Nonetheless, there are still several issues that should be addressed. Again, Contractor on the Battlefield becomes a major concern when these activities occur in a hostile environment. Also, the lack of appropriate facilities, equipment, and trained personnel can affect the Fleet Manager's performance in these activities. As a result, End Item & Secondary Item Repair is considered a moderate risk element.

G. SUMMARY

The main objective of the risk analysis process is to determine where the risks are likely to occur and the magnitude or impact of these risks on the program. The researcher used the watchlist developed in Chapter IV and applied the watchlist to the CONOPS Document to accomplish this objective. Listed below are the highest risk elements in each of the program's major areas.

1. Program Management - 1.1

   High Risk Element - Contract Oversight - 1.1.1

2. Fleet Logistical Support - 1.2

   High Risk Element - Item Management - 1.2.1

3. System Technical Support - 1.3

   High Risk Elements - Engineering - 1.3.1

4. Manufacturing/Maintenance - 1.4

   High Risk Elements - Maintenance - 1.4.2

The final step in the risk management process is Risk Handling, which is discussed in Chapter III. Risk Handling addresses the specifics on what should be done, when it should be done, who is responsible, and the impact of the action or inaction. The Program Office can now take the results derived from the assessment and analysis phase to develop the most appropriate strategy to obtain an acceptable risk level in each of the four major areas, given program constraints and objectives.

VI. SUMMARY AND RECOMMENDATIONS

A. SUMMARY

The purpose of this thesis was to conduct a risk assessment and analysis of the M109 FOV Fleet Management Pilot Program. Fleet Management is a new initiative by the Army to place a single entity, a Fleet Manager, in charge of maintaining the M109 FOV Fleet. The overall goal of this program is to reduce operational and support costs while improving weapon system performance. The general approach in achieving this goal is to implement both better commercial business practices and to outsource logistical support functions. Unfortunately, there are many uncertainties in implementing a fleet management approach for sustaining a major weapon system. Thus, it is imperative to develop a formal risk management plan that can identify, assess, analyze, control, and document all the risks associated with the program.

DoD's acquisition process has designed, fielded, and sustained world-class weapon systems for decades. The superior performance of U.S. systems was demonstrated during the Gulf War. Although this acquisition process has been very effective in accomplishing its mission, budgetary constraints have forced DoD to adopt new processes to improve efficiency. Many officials advocate reducing the support infrastructure as the first step in improving DoD's efficiency. In the QDR, Secretary Cohen emphasizes that the military must change in response to today's fiscal environment. DoD must be more efficient and cost-effective to serve the warfighter faster, better, and cheaper. [Ref. 10:Section VIII p. 1]

Presently, DoD maintains a huge infrastructure that consumes a large and growing portion of DoD's budget. Over the last several years, infrastructure reductions have lagged force structure reductions by over 10%. As a result, the SECDEF firmly believes that the defense infrastructure must be reduced further to keep pace with force structure reductions and to eliminate inefficiency. According to the SECDEF, Joint Vision 2010 will require a radically different support structure that will force DoD to reengineer its infrastructure. A critical part of this reengineering process is to outsource more non-warfighting DoD support functions. [Ref. 10:Section VIII, p. 2]

The M109 Fleet Management Program supports this reengineering effort by outsourcing those functions that make sense and can be performed more efficiently by a private contractor. To assess and analyze the risks associated with the program, the researcher first discusses the Government's policy on outsourcing and outlines the goals

and objectives for Fleet Management. Next, the author provides a brief overview on the risk management process and discusses DoD's policy pertaining to risk management. Finally, the author describes the methodology used to conduct the risk assessment and analysis process. This chapter provides a summary of the study, recommendations, and areas for further research.

1. Outsourcing and Fleet Management Overview

Over the past several years there have been numerous studies citing the benefits of outsourcing. The CORM and the DSB believe DoD can save 30% or more by outsourcing more commercial-type functions. Secretary Cohen also believes that DoD can achieve greater efficiencies by outsourcing more non-warfighting activities. The Secretary feels that DoD should redefine its concept of core activities by narrowing the scope to include only those activities that are "inherently Governmental." Secretary Cohen outlines the Depart-ment's evolving policy on outsourcing in Section VIII of the QDR: Achieving a 21st Century Defense Infrastructure. In the QDR, Secretary Cohen supports an aggressive outsourcing policy by encouraging the Services to outsource infrastructure functions that are closely related to commercial functions. Past experience indicates that DoD can enjoy many of the same benefits that private industry has gained from outsourcing - "tighter focus on core tasks; better service quality; more responsiveness and agility; better access to new technologies; and lower costs." [Ref. 10:Section VIII , p. 2] In addition to the advantages cited in the QDR, many proponents of outsourcing argue that contracting out services normally performed by the Government promotes competition which stimulates the economy. This increased competition is usually followed by economic efficiency.

Unfortunately, outsourcing will not achieve these benefits in all cases. Government officials should evaluate each potential outsourcing initiative on a case-by-case basis. In many cases, outsourcing a proposed function may be impossible due to statutory restrictions and/or regulations. Also, there are many potential disadvantages that must be considered. First, commanders are forced to give up control over critical resources when they transfer the responsibility to a contractor. Second, in many markets where there is limited competition, industry will gain tremendous leverage over the Government when setting prices. Thus, economic efficiencies will not be achieved. These situations can also foster an environment that can lead to fraud and abuse. Finally, the Government will be saddled with the additional cost of initiating the procurement process. More importantly, achieving the benefits of outsourcing assumes the

Government will develop a contract that is beneficial to both the Government and industry. This is very difficult, especially for large complex service contracts.

The M109 Fleet Management Pilot Program hopes to achieve the benefits of outsourcing by contracting out those logistical support functions that can be performed more efficiently by private industry. This approach places one contractor in charge of maintaining the fleet. The Government does not abdicate its responsibility of maintaining the fleet, but transfers those functions to a private contractor who can manage and perform these functions more efficiently. The goal of the Pilot Program is to generate significant savings in life-cycle support costs by applying best business practices, streamlining the supply pipeline, and implementing technological improvements. These savings can be redirected to improve operational readiness and performance by continuously modernizing spare parts and components. In addition, the Fleet Manager will establish a communications and support infrastructure that will provide better and more responsive support to its customers worldwide.

Presently, the scope of the M109 Fleet Management Program is still evolving. Conceptually, the Government will achieve the greatest efficiency by broadening the scope of the Fleet Manager's functions. Thus, the Government developed the Concept of Operations (CONOPS) Document, which outlines all the functions performed by the Government to sustain the fleet. Initially, the Government considered all the functions contained in this document; thus, it represents all the potential functions that could be outsourced to the Fleet Manager (see Appendix A). The Pilot Program is subdivided into three major areas: Fleet Logistical Support, System Technical Support, and Manufacturing/Maintenance. Each of these major areas major areas are further subdivided into lower elements. In Chapter II, the researcher describes these third-level elements in detail. To date, only Life-Cycle Software Support, element 1.3.6, has been removed from Fleet Management. This element will be performed by the Government.

2. Risk Management Overview

Risk can be defined as a measure of the inability to achieve project objectives within defined cost, schedule, and technical constraints. Risk involves uncertainty and has two components: (1) the probability of failing to achieve a particular outcome and (2) the consequence of failing to achieve that outcome. As a new and untested concept, there are numerous uncertainties associated with implementing the Fleet Management Concept. As a result, it is essential to conduct a formal and deliberate risk management process. Project Management Institute defines risk management as the "processes concerned with identifying, analyzing, and responding to project risks." [Ref. 22:p. 111]

This process includes maximizing the results of positive events (opportunities) and minimizing the consequences of negative events (risk events). PMI's approach contains four major processes: Risk Identification, Risk Quantification, Risk Response Development, and Risk Response Control.

The DoD Risk Management Process that is taught to the acquisition workforce is contained in current DSMC publications. Unlike PMI's approach, DSMC's process is from a program office's viewpoint and is only concerned with minimizing the consequences of adverse events. Also, DSMC's approach contains four different major processes: Risk Planning, Risk Assessment, Risk Analysis, Risk Handling. Although both approaches are slightly different, their overall objective is essentially the same: to develop a formal and systematic process to identify, assess, analyze, control, and document risk events throughout the life of the project.

Program managers of Defense acquisition programs are responsible for ensuring risk management plans are effective. The 1996 updates to DoD Directive 5000.1 and DoD 5000.2R have significantly increased emphasis on the importance of risk management in managing Defense acquisition systems. These documents state that program managers are to use risk management plans to identify and track risk events, define risk abatement plans, and provide continuous risk assessment throughout each acquisition phase to deter-mine how risks have changed. [Ref. 16:p. 2] Specifically, DoD 5000.1 requires that risk management plans be assessed at each milestone decision point before approval is granted to proceed into the next acquisition phase. DoD 5000.2R requires the program manager to establish a formal risk management program with industry and user involvement.

3. Risk Assessment

The researcher used DSMC's approach to conduct the risk assessment process for the M109 Fleet Management Program. The first step in the assessment process, Risk Identifica-tion, was accomplished by surveys and interviews. The researcher used the CONOPS Document (Appendix A) as a preliminary WBS that provided a framework for identifying and organizing the risk events. The next step, Risk Quantification, took the qualitative information derived from the Risk Identification Surveys and transformed this information into quantitative risk estimates for each risk event. Again, the researcher used the CONOPS Document as a tool to develop the Risk Assessment Surveys (Appendix B). The researcher developed a risk rating scale for the survey that provided a framework for evaluating and quantifying the risk events. Once all assessment surveys were collected and consolidated, an RES was calculated for each risk event. The RES for

each risk event enabled the researcher to identify the most significant risk events in each of the program's major areas. The researcher portrayed the quantitative results from the surveys in the form of a Risk Rating Diagram. These Risk Rating Diagrams (Chapter IV) identify the top-ten risk events for each major area. The end result of the Risk Assessment Process was the development of a Risk Event Watchlist. The researcher developed four Risk Event Watchlists, one for each of the program's major areas. The complete Risk Event Watchlists are listed in Appendix C.

4. Risk Analysis

The researcher had two primary goals in the risk analysis process: first, determine which areas in the program exhibit the highest degree of risk; second, analyze the potential impact, on cost and/or performance, that high risk events have on the program. To accomplish these goals, the researcher used a graphical analysis technique by portraying the risk events on a risk chart. The CONOPS Document provided a framework for developing the risk charts. A hierarchical list of all risk events, with their corresponding RES values, were listed under each third-level CONOPS element. The researcher developed a risk rating scale to categorize each risk event as either high, medium, or low based on their RES values. The risk charts in Chapter V graphical portray the high risk areas in the program. The researcher developed four risk charts, one for each of the program's major areas.

B. RECOMMENDATIONS

The researcher recommends the PM use the Risk Event Watchlists and the Risk Charts to develop the Program's Risk Handling Plan. The Risk Event Watchlists identify the most serious risk events associated with the program and are a convenient way to track and prioritize the different risk events. The Risk Charts categorize the different risk events and help to identify the high risk areas in the CONOPS Document. Both products are valuable risk management tools and should be utilized in developing risk mitigation strategies.

Critical to successful Risk Management is the PM's ability to control or handle the different risk events. Risk Handling is the action or inaction taken by the program office to address the different risk events associated with the program. [Ref. 7:pp. 4-10] The PM should develop an appropriate strategy necessary to obtain an acceptable risk level for the program, given program constraints and objectives.

During the risk assessment process, the researcher identified both internal and external risk events. It is necessary for the PM to distinguish between these two types of

risks to efficiently use his resources to mitigate and control the different risk events. It is primarily the PM's responsibility to control internal risk events. On the other hand, it is primarily a higher headquarter's responsibility, such as the Department of the Army (DA) or the Office of the Secretary of Defense (OSD), to control external risks. However, the PM does play a role in controlling external risks and should use his influence to reduce external risks whenever possible.

1. External Risks

There are numerous risk areas that are external to the program office that the PM must be able to identify. Often, the PM will be forced to modify his acquisition strategy based on these external factors. These areas are discussed below. [Ref. 6:p. 4.5-3]

1. **Funding.** Funding is the greatest external risk that can affect the program. Almost all support tasks are based on having appropriate funding levels. Changes to the funding level can have a significant impact on the program's success. The program's acquisition strategy is based on its anticipated funding level and without adequate and consistent funding, performance on the contract will suffer. As a result, the PM must prioritize those tasks that are critical to sustain the fleet in the field. From the risk charts, there are several high risk events related to this area.

2. **Threats and Requirements.** No one can predict with certainty the threat in five or ten years. As a result, it is impossible to determine the exact requirements needed to support the fleet into the twenty-first century. Many of the support tasks in the Fleet Logistical Support area are developed based on certain requirements. Changing these requirements can have a serious impact on Fleet Manager's ability to support the Fleet. Thus, the Program Office and the Fleet Manager must remain flexible to respond to these changing requirements.

3. **Politics.** Although Fleet Management is not a new system development program, there are many external sources involved in Fleet Management. As a result, politics will play a major role in deciding the scope of the program. The PM must be cognizant of this political environment and know all the stakeholders in the program and their agendas. This will enable the PM to foster relationships with external sources that can benefit the program and reduce uncertainty. Although the PM cannot control these external risk areas, he must monitor their impact on accomplishing the program's objectives.

DoD's complex acquisition process has created an uncertain environment that can prevent or hinder successful outsourcing initiatives from realizing their full potential. As a result, it is OSD's and DA's responsibility to recommend and implement policy

changes that will reduce this uncertain environment for the PM. Below are several policy recommendations that OSD and/or DA could adopt to reduce the risks associated with the M109 Fleet Management Program and outsourcing in general.

First, OSD should set forth funding guidance for outsourcing initiatives in the Defense Planning Guidance (DPG). This will require the Services to allocate appropriate funding to outsourcing initiatives when they submit their biannual Program Objective Memorandums (POMs). Although this is difficult given current fiscal constraints, DoD needs to make the necessary investment up-front in order to realize the potential benefits of Fleet Management.

Second, OSD should work with congressional leaders to remove statutory requirements and restrictions. To realize the potential benefits of outsourcing, decisions on outsourcing a particular function should be made on the capability and reliability of the service provider, not on a regulation. Third, OSD should work to establish a formal policy regarding a contractor's involvement in a hostile environment (i.e., a war zone). This policy should set forth procedures that will enhance the contractor's responsiveness to the user, while offering safeguards to contractor. Fourth, OSD and DA should address personnel matters proactively and should provide early and sustained communication to all DoD personnel. Fleet Management could displace Government employees. As a result, OSD should consider policies for appropriate retraining, outplacement, and severance packages for all displaced employees. Finally, a cultural change is needed to change DoD's support infrastructure. This cultural change will require the SECDEF's role on outsourcing initiatives to be highly-visible and sustained. Thus, the SECDEF should issue a formal policy statement promoting outsourcing opportunities and should require service secretaries to establish similar policy statements.

2. Internal Risks

As previously discussed in Chapter III, there are four primary methods for handling risk events associated with the program. These methods include Risk Avoidance, Risk Control, Risk Assumption, and Risk Transfer. The PM needs to conscientiously use these methods to control each risk event throughout the life of the program. The following discussion illustrates how the PM can apply these methods to handle the risks associated with Fleet Management. [Ref. 15:p. 895]

1. **Risk Avoidance.** The PM can reduce uncertainty in the program by eliminating the source of the risk. For example, in the System Technical Support area, the Product Improvement element was assessed as a high risk. The PM can reduce or mitigate this risk by eliminating this requirement in the contract. Unfortunately, not all

risk events can be totally avoided. An action that avoids one risk may simply transfer that risk to another area. The source selection process also allows the PM to avoid unwanted risks. An effective source selection board will help the PM identify shortcomings of competitive sources to avoid sources having unacceptable risks.

2. **Risk Control.** Controlling risks involves the development of a risk reduction plan and then following that plan. This will require the PM to develop fall-back positions for different risk events. For example, the PM can require the Fleet Manager to develop an alternative distribution method to ensure parts are delivered to its customers on time. Tracking high risk areas requires the PM to develop appropriate performance metrics that are easy to monitor and measure. Earned Value Management Tools such as Performance Analyzer can also assist the PM in tracking cost and schedule risks in high risk areas.

3. **Risk Assumption.** Due to budget constraints, the PM does not have the resources to control all the risks associated with Fleet Management. As a result, the PM will be forced to assume some of the risks involved in implementing the program. However, it is critical that the PM assumes the "right" risks such as those with either low probability, low consequences, or both. For example, the risk events labeled Low Risk on the risk charts in Chapter V should be accepted before the Medium or High Risks are accepted.

4. **Risk Transfer.** The PM should also attempt to transfer the risks from the Government to the Fleet Manager whenever possible. Options for risk transfer include product performance incentives, warranties, cost incentives, and performance bonds. In addition, selecting the appropriate contract type will transfer part of the risk to the Fleet Manager.

Once the appropriate method for controlling each risk event has been selected, the PM should continually document the process. Documentation should address the specifics on what should be done, when it should be done, who is responsible, and the impact of the action or inaction of the risk handling technique. As previously discussed, an effective risk management program requires early and continual involvement from the entire program team. As a result, the researcher recommends periodical risk management reviews to update and assess the effectiveness of the risk management plan. The entire program team, to include the Fleet Manager and User Representatives, should attend these reviews.

3. Areas for Risk Handling Emphasis

From the assessment and analysis portions of this thesis, the researcher identified several interrelated areas which, if emphasized in risk handling, would have potentially high payoffs throughout the program. First, the Fleet Management contract structure will affect all major areas in the program. Thus, it is critical for the Government to develop a contract that allows the Fleet Manager maximum flexibility to implement best business practices whenever possible. At the same time, the Government must provide the appropriate incentives that will motivate the contractor to achieve the desired results that will not conflict with other program objectives. In addition, it is important for the Government to create measurable metrics for contract performance that do not create an unnecessary administra-tive burden. If the Government can not accomplish these critical tasks, multiple areas throughout the program will be affected. Second, the Government must develop accurate cost estimates for all activities throughout the program. The goal of Fleet Management is to achieve significant cost-savings on virtually all life-cycle support activities. This will require the Government to determine an accurate baseline cost for each proposed outsourced function. A Preliminary Cost Benefit Analysis has determined "rough estimates" for several areas in the program. However, there is little confidence in these figures. If the Government cannot develop an accurate cost model to predict costs and savings, the program will not achieve its stated goals. Finally, personnel management will impact on practically every function included in the program. Thus, it is essential for the PM to determine the right mix of qualified Government employees in the program. These employees will perform several critical functions that will enable Fleet Management to succeed. First, they will help provide oversight on the contract. Second, they will establish the necessary interfaces with the Fleet Manager that will allow the Government to effectively coordinate activities in support of the fleet. Third, they will establish a cooperative and professional relationship with the Fleet Manager that is based on mutual respect and trust. The PM must also work closely with the Fleet Manager to ensure that it has the appropriate skills in its workforce to perform all the activities in the contract.

C. AREAS FOR FURTHER RESEARCH

The following are suggested areas for further research:

1. Conduct a risk assessment and analysis of the program once the scope for Fleet Management has been finalized. To date, the scope of activities included under the Fleet Management Concept is still evolving. Once the RFP is finalized and the contract is awarded, the risk assessment and analysis contained in this research can be updated.

Students selecting this topic could use the actual WBS instead of the CONOPS Document. In addition, the student can broaden the survey population by including more people outside the Program Office.

2. Conduct a risk assessment and analysis of the program using a different methodology and/or technique. There are numerous techniques and software tools available to the PM to conduct a risk assessment and analysis of the program. Students selecting this approach can select one of these alternative technique. For example, students could use Decision Analysis or Transition Templates to assess and analyze the different risk events.

3. Analyze the Risk Management Plan developed by the Program Office. Students selecting this topic can analyze the risk handling techniques employed by the Program Office to mitigate the different risks. Specifically, students can evaluate the effectiveness of these techniques and offer alternative methods for reducing program risks.

4. Analyze the different outsourcing initiatives implemented by all the Services. Students selecting this topic can compare and contrast the different outsourcing initiatives throughout DoD. Specifically, the student can evaluate the effectiveness of these initiatives in accomplishing their goals. Also, the student can uncover trends and pathologies that could be beneficial for future outsourcing initiatives.

APPENDIX A. CONCEPT OF OPERATIONS (CONOPS) DOCUMENT

1. M109 FOV Fleet Management ConOps
    1.1 Overall Program Management Oversight
        1.1.1 Contract Oversight
        1.1.2 General Management
            1.1.2.1 Approval
            1.1.2.2 Coordinate
            1.1.2.3 Integration
            1.1.2.4 Review
            1.1.2.5 Certify
            1.1.2.6 Monitor
        1.1.3 Requirements Determination (Top Level)
        1.1.4 Budget and execution
        1.1.5 Long-term planning
    1.2 Fleet Logistics Support
        1.2.1 Item Management
            1.2.1.1 Parts Management
                1.2.1.1.1 Requirements Determination
                1.2.1.1.2 Procurement direction
                1.2.1.1.3 Cataloging
                1.2.1.1.4 Repair direction
                1.2.1.1.5 Distribution Direction
                1.2.1.1.6 Disposal/Excess Direction
            1.2.1.2 End Item Management
                1.2.1.2.1 Forecast/Budget Development
                1.2.1.2.2 Cataloging
                1.2.1.2.3 Disposal/Demilitarization
                1.2.1.2.4 Distribution
                    1.2.1.2.4.1 End Items
                    1.2.1.2.4.2 Mod Kits
                1.2.1.2.5 Repair Direction
            1.2.1.3 Stock Control
        1.2.2 Physical Distribution
            1.2.2.1 Warehousing
            1.2.2.2 Inventory Control
            1.2.2.3 Transport
        1.2.3 Maintenance Management
            1.2.3.1 Develop maintenance concept
                1.2.3.1.1 Source Selection (fabricate, purchase)
                1.2.3.1.2 Provisioning
                1.2.3.1.3 Needs Determination

1.2.3.1.4 Cataloging
1.2.3.2 Technical Publications
1.2.3.2.1 Modification Work Orders
1.2.3.3 Field Data
1.2.3.4 Technical Support
1.2.4 Facilities Planning and Management
1.2.5 Materiel Fielding
1.2.5.1 Total Package Fielding (to include Major Modifications)
1.2.5.1.1 Fielding Plan Coordination
1.2.5.1.2 New Materiel Introductory Briefing
1.2.5.1.3 Coordination Meetings
1.2.5.1.4 New Equipment Training
1.2.5.1.5 Deprocessing of Equipment
1.2.6 Customer Support
1.2.7 Collect Performance Data
1.3 System Technical Support
1.3.1 Engineering
1.3.1.1 safety
1.3.1.2 quality
1.3.1.3 design
1.3.1.4 RAM
1.3.1.5 producability
1.3.1.6 Manprint
1.3.1.7 logistics
1.3.1.8 system
1.3.2 Configuration/Change Management
1.3.2.1 prepare/process changes
1.3.2.2 maintain and distribute technical data
1.3.2.3 provide electronic access to all technical data
1.3.2.4 develop and define performance specifications
1.3.3 Test & Evaluation
1.3.4 Product Improvement
1.3.5 customer support
1.3.5.1 Training
1.3.5.2 field support
1.3.5.3 designer support
1.3.6 Life Cycle Software Support
1.3.6.1 vehicle specific
1.3.6.1.1 diagnostic and test equipment
1.3.6.1.2 embedded software
1.3.6.2 Integrated Information Systems
1.4 Manufacturing/Maintenance (for end item and secondary spares)
1.4.1 Manufacturing
1.4.2 Maintenance

1.4.3 Modifications/Conversions
1.4.4 End Item and Secondary Item Repair/Overhaul

APPENDIX B. THE M109 FLEET MANAGEMENT RISK ASSESSMENT SURVEY

The purpose of this survey is to quantify the risks involved in implementing the M109 Fleet Management Program. I have used the Concept of Operations Document (CONOPS) (20 Feb 1997) as the preliminary Work Breakdown Structure (WBS) to help identify the risks. The CONOPS Document describes all the functions performed by the government for the M109 FOV Fleet. The objective of the M109 Pilot Program is to reengineer the logistical support system by outsourcing those functions that make sense and can be performed more efficiently. The scope of Fleet Management will undoubtedly change as the program evolves; therefore, the CONOPS Document is used as a baseline to describe the total scope of the program and the potential functions to be outsourced.

Various functional experts/managers have already identified the potential risk events under each WBS element. Please use the scale below to assess each risk event in terms of probability of occurrence (likelihood) and severity of impact (consequence) by placing the Assessment/Rating number in the appropriate column. Severity of impact will be evaluated for both cost and technical/performance. If the risk event does not impact on cost or performance, place **N/A** in the appropriate column. If you feel you are not qualified to assess the risks place **N/Q** in the appropriate column.

LIKELIHOOD:

What is the likelihood the risk event will occur?	Assessment/Rating
Remote	1
Unlikely	2
Likely	3
Highly Likely	4
Near Certain	5

CONSEQUENCE: Given the risk is realized, what is the severity of impact?

	Assessment/ Rating	Performance/Technical	Assessment/ Rating
Minimal or no impact - Budget Estimates not exceeded	1	Minimal impact to performance/readiness goals	1
Budget estimates slightly exceeded and/or cost savings still realized over existing system	2	Acceptable with some reduction to margin/baseline. Tech/Perf improvements still realized over existing system	2
Budget estimates exceeded. Minimal or no cost savings over existing system	3	Acceptable with significant reduction to margin/baseline. Minimal or no Tech/Perf improvement over existing system	3
Budget estimates exceeded. Actual cost actually exceeds existing systems cost	4	Acceptable with no remaining margin. Perf/Tech actually less than existing system	4
Budget estimates significantly exceeded. Actual cost greatly exceeds existing costs	5	Unacceptable - technical/performance goals not met. Significant degradation in performance from existing system	5

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
1.1 - PROGRAM MANAGEMENT			
1.1.1 - Contract Oversight			
1. Transition Planning - Ineffective planning and oversight of Fleet Management.			
2. Govt. Experience - No prior experience by the Govt. to manage a Fleet Manager (FM) of this size and scope.			
3. Performance Metrics and Incentives - Inability to establish performance requirements and accurately measure and reward FM performance.			
4. Day to Day Exposure - Inability of the Govt. to maintain oversight/exposure with the FM on a daily basis. Inability to keep abreast of daily operations.			
5. Ineffective Contract Structure/Requirements - Unplanned or undesirable contract support due to faulty contract requirements.			
6. Project Milestones - Missing planned milestones due to inaccurate time estimates or inadequate performance.			
7. Status Reporting - Failure to have a system to routinely report financial, parts delivery, performance, etc. status to all customers.			
8. Non-Performance by the FM - Failure by the FM to provide required products and services.			
9. Complexity of Contract - Failure by the Govt. to properly manage contract in a standardize manner due to complexity and uniqueness.			
10. Retention of Personnel - Inability to retain quality personnel in both technical and management ends needed for proper oversight. Loss of control and knowledge of the system.			
1.1.2 - General Management			
1. Govt. Employee Resistance - Refusal by Govt. employees to cooperate, implement, and work with FM. Inability to change business culture.			
2. Communications - Inability of the Govt. and FM to establish effective lines of Communication.			
3. Security - Inability of the FM to provide adequate security for confidential equipment and data. Inability to provide secure Commo via Internet.			
4. Govt. Employee Union - Lack of cooperation and legal challenges.			
5. Personnel Management - Difficulties arising from Govt. personnel disruptions due to outsourcing of M109 FOV support.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
6. Legal Conflicts - Conflict with core policy, 60/40 rule, and $3 million competition rules.			
7. Retreat Plan - Failure to have a executable plan to retreat out of FM.			
8. Retention of Personnel - Inability to retain quality personnel in both technical and management ends needed for proper Govt. management functions. Loss of control and knowledge of the system.			
9. Contingency Response - Inability of FM management to remain flexible in order to deal with contingency operations - e.g. surge capability.			
10. Bankruptcy - Weak financial strength will lead to bankruptcy.			
11. Transition Planning - Ineffective planning and execution of Fleet Management.			
1.1.3 - Requirements Determination			
1. Commercial Business Practices - Inability of FM to fully use commercial practices.			
2. Parts Inventory Management - Unsatisfactory resolution of issues or performance regarding parts ownership, requirements, obsolescence, surpluses, stock levels, interoperability etc.			
3. Scope of Parts Supply - Inappropriate decisions on what parts to have the FM provide - (all, just M109 unique, only mission critical, etc.).			
4. Customer Satisfaction - Inability by FM to determine customer satisfaction on support.			
5. Loss of Organic Capability - Loss by the Govt. to determine appropriate requirements for support.			
6. Complexity of Requirements - Inability of the FM to adequately define, determine, understand military unique requirements. Inability to address all requirements.			
7. Changing Requirements - Inability of the FM to respond on a daily basis to changing requirements. Can't be tied to contractual limitation to respond.			
8. Software Requirements - Inability by FM to determine software requirements.			
1.1.4 - Budget and Execution			
1. Funding - Delay or inability to allocate appropriate OMA and PA fund lines to the FM after contract award.			
2. Front End Funding - Pre Contract Activity - insufficient funding to support program management activities prior to award that will impact the FM once contract is singed.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
3. Unrealization of Savings - Variance from planned budget and projected savings.			
4. Transition Planning - Ineffective planning and execution of fleet management.			
5. Pricing - Unstable or unfair prices for parts and services provided by the FM.			
6. Financial Pricing Methodology - Inability to establish an efficient process for billing and paying.			
7. Requisition Spending Controls - Difficulties relating to effective fiscal controls when ordering directly from the vendor.			
8. Disposition of Current Parts Inventory - Trauma involved with the disposition or transition of current parts inventory to FM ownership.			
9. Status Reporting - failure to have a system to routinely report financial , parts delivery, performance, asset visibility etc. status to customers.			
10. Data Availability - Inability of customers and legacy users to get M109 FOV life cycle support data necessary to perform their mission.			
1.1.5 - Long Term Planning			
1. Retreat Plan - Failure to have a executable plan to retreat out of fleet management			
2. FMS - Inability of the FM to support FMS customers long term.			
3. Future Program Needs - Inability of FM to project and respond to future needs of program.			
4. War Reserve - Failure of the FM to maintain adequate stock or inability to deliver when needed.			
5. Approval Level - Inability of FM to obtain approval from Govt. on changes to program. Inability to gain permission to use new and innovative business practices.			
6. Organic Capability - Loss of organic technical and manufacturing capability by the Govt.			
7. Repair Work/Field Maintenance - Inability of the FM to plan for reliable repair work and field Maintenance.			
8. Centralization - Trend by Govt. to require centralize operations could stifle ideas and waste time.			
9. Transition to Readiness Command - Premature Transition to Readiness Command before concept of FM has matured and experience/lessons learned have been gained.			
10. Loss of Program Knowledge - Loss of knowledge and technical interface by the govt. will inhibit long term planning by the Govt.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
1.2 - FLEET LOGISTICAL SUPPORT			
1.2.1 - Item Management			
1. Transition Planning - Ineffective planning and execution of fleet management.			
2. Commercial Business Practices - Inability of FM to use commercial practices or to implement new business processes without negatively affecting the functionality of current STAMIS.			
3. Status Reporting - Failure to have a system to routinely report financial, parts delivery, accountability performance, status to all customers.			
4. Scope of Parts Supply - Inappropriate decision on what parts to have the FM provide - (all, M109 Unique, mission critical only, etc.)			
5. Govt. Changes (e.g. Downsizing) - Inability to effectively manage inventory due to constant changes. Ex. Inaccurate forecasting and/or managing surpluses.			
6. Incompatible FM Processes - FM's item management process may be incompatible with existing system and may not input to Govt. budgeting process.			
7. Disposition of Current Inventory - Inability to efficiently transfer ownership of parts to FM.			
8. Pricing - Unstable or unfair prices for parts provided by FM caused by not utilizing AMDF prices or by unexpected Govt. Surcharges on parts.			
9. DBOF Replenishment - Inability of the Govt. to replenish the DBOF once inventory is transferred to the FM. Current inventory is an investment in the DBOF.			
10. Contingency Response - Inability to manage items effectively during contingencies - e.g. Managing surge capability.			
11. War Reserve - Inability of FM to properly manage/maintain adequate War Reserve.			
12. Parts Inventory Management - Unsatisfactory resolution of issues or performance regarding, requirements, obsolescence, surpluses, stock levels, etc.			
13. Acquisition Reform - Inability of FM to achieve projected savings/performance improvements due to Acquisition Reform Initiatives already implemented.			
14. Sources of Supply - Inability of FM to establish/maintain reliable and credible vendors.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
1.2.2 - Physical Distribution			
1. Deployed Operations - Inability to provide FM support to units deployed. Inability of Commercial Agent to deliver.			
2. Communication Capability - Inability to implement direct communications between FM and customer. Inability of FM to Establish/maintain electronic interface with customers.			
3. Status Reporting - Failure to have a system to report parts delivery/status to customers.			
4. Priority Setting - Failure of the FM to establish an equitable system for allocation of parts.			
5. Commercial Transport - Inability of FM to fully utilize commercial only transport to reduce delivery times. Budgeting may be insufficient to support commercial only transport.			
6. Customs Delays - Inability of FM to achieve delivery goals due to Custom Delays (e.g. Korea).			
7. Accountability Compatibility - Incompatible accountability between FM and Govt. systems.			
8. Total Asset Visibility - Failure of FM to maintain TAV of parts/equipment during transport.			
9. Scope of Parts Supply - Inappropriate decision on what parts to have the FM provide - (all, M109 Unique, mission critical only, etc.)			
10. Repair Parts Availability - inability of FM to provide an adequate supply of spare parts.			
1.2.3 Maintenance Management			
1. Technical Expertise - Inability of the FM to acquire and provide the necessary expertise to maintain the system in the field.			
2. Fleet Management Baseline Change - Changing requirements could effect FM baseline for both services and personnel requirements.			
3. Organic Capability - Loss of organic maintenance capability by the Govt.			
4. Contractor on the Battlefield - Liability or lack of presence of FM to provide support in times of war.			
5. TM/Manual Maintenance/Distribution - Inability to FM to prepare, maintain, print, and distribute TMs/Manuals.			
1.2.4 - Facilities Planning Management			
1. FM Facilities - failure of the FM to have adequate facilities to store and maintain inventory.			
2. Environmental Concerns - Failure by the FM to adhere to all environmental and hazardous material concerns.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
3. Political Process - Future BRAC could change baseline and eliminate available facilities.			
1.2.5 - Material Fielding			
1. Training - Inability of FM or Govt. to provide necessary customer training.			
2. Doctrinal Changes - Inability of FM to adapt to Doctrinal changes. Doctrinal Changes may affect baseline and upset fielding plan.			
3. Funds Availability - Inability of FM to field equipment due to funding constraints after contract award.			
1.2.6 - Customer Support			
1. Deployed Operations - Inability to provide customer support for deployed units.			
2. Communications Capability - Inability to implement direct communication between the customer and the FM.			
3. Business Hardware/Software - Inability to provide equipment needed to support a direct link to the FM.			
4. Technical Support - Inadequate technical support by FM at the customer level.			
5. Cost Considerations - Potential for limited use of FM support if costs are charges "per encounter."			
6. Training - inability of Govt. or Fm to provide necessary training to customer.			
7. Contractor on the Battlefield - liability or lack of presence of FM to provide support in times of war.			
8. Parallel Govt. Log Assistant Rep. - need for Govt. to provide parallel Govt. Assistance to the customer.			
1.2.7 - Collect Performance Data			
1. Data Collection - Failure on the FM to have a system in place that can properly collect and analyze the data.			
2. Existing Sample Data Collection (SDC) Methods - Incompatible methods in SDC between FM and existing system.			
3. Communications Capability - Inability to implement direct communication between the customer and the FM. Inability of FM to establish/provide electronic interface with customers.			
4. Business Hardware/Software - Inability to provide equipment needed to support a direct link to the FM.			
5. Status Reporting - Failure to have a system to routinely report performance status to all customers.			

WBS#/Element Risk Event/Description	Likelihood	Consequence Cost	 Perf
1.3 - SYSTEM TECHNICAL SUPPORT			
1.3.1 - Engineering			
1. Technical/Functional Experts - Inability of the FM to obtain and retain expertise in all technical disciplines - software/hardware, explosives, cannon technology, hydraulics, automotive, commo, fire control, etc.			
2. Technical Data - Unsatisfactory resolution of availability, format, ownership, assess for all tech data. Inability of FM to create/maintain technical data packages necessary for life cycle support.			
3. Program History/Lessons Learned - Loss of Program History/Lessons Learned on the part of the Govt. and no or limited past experience on the part of the FM.			
4. Lack of Incentive by FM - No incentive for FM to design for low life cycle costs when he is also paid for replacement parts.			
5. Communications Interoperability - Failure by the FM to design for communications interoperability with other systems on the battlefield.			
6. Safety - Failure by the FM to design for safety requirements.			
7. Scope of Parts Supply - Inappropriate decision on what parts to have the FM provide - (all, M109 Unique, mission critical only, etc.)			
1.3.2 - Configuration/Change Management			
1. Unnecessary Changes - FM could generate unnecessary changes.			
2. Interoperability - Failure of the FM to make correct changes/mods that could adversely effect interoperability between systems.			
3. TDP Changes - FM could make TDP changes to his advantage that could limit/prevent future competition e.g. FM would become life time sole source provider.			
4. Configuration Management - Ineffective configuration control or imposition of excessive oversight that prevents the FM from using commercial CM practices.			
5. Change Approval - Inability by the FM to obtain approval for performance changes by the Govt. in an efficient and timely manner.			

1.3.3 - Test & Evaluation			
1. Testing Expertise - Inability of FM to obtain appropriate technical expertise in testing procedures that will consider all essential factors -e.g. safety, interoperability, realism, human interfaces, etc.			
2. Testing Resources - Inability of the FM to use/acquire appropriate facilities and resources to conduct testing - e.g., ammunition, access to Govt. test site/equipment.			
3. Objectivity of FM Conducting Testing - Inability of FM to conduct test in an objective manner if FM is designer, tester, and approver.			
1.3.4 - Product Improvements			
1. Product Improvement Opportunity Identification - Inability of the FM to identify and exploit all opportunities that help avoid costs and enhance performance.			
2. Requirements Coordination - Inability of the FM to conform to Army directives of exploiting commonality and expanding interoperability.			
3. Funding - Inability of the Govt. to properly fund P3I.			
4. Testing P3I - Inability of the FM to properly test P3I.			
5. P3I Approval - Inability of FM to gain approval from Govt. on P3I in a efficient and timely manner.			
6. P3I Prioritization - Inability of FM to prioritize those items that need P3I.			
7. Modernization through Spares - Inability to implement business practices that cause the FM to provide better performing and more cost effective spare parts. Inability of Govt. to incentivize low life cycle costs.			
1.3.5 - Customer Support			
1. Deployed Operations - Inability to provide customer support for deployed units.			
2. Communications Capability - Inability to implement direct communication between the customer and the FM. Inability of FM to establish electronic interface with all customers and to provide real time technical data to customers.			
3. Business Hardware/Software - Inability to provide equipment needed to support a direct link to the FM.			
4. Technical Support - Inadequate technical support by FM at the customer level. Inability to provide technical expertise and/or needed equipment/parts to customer.			
5. Cost Considerations - Potential for limited use of FM support if costs are charges "per encounter."			

6.	Training - Inability of Govt. or Fm to provide necessary training to customer.			
7.	Contractor on the Battlefield - Liability or lack of presence of FM to provide support in times of war.			
8.	Customer Satisfaction - Inability of FM to determine customer satisfaction and to make appropriate changes is needed.			
9.	Undefined Costs/Requirements - Inability of Govt. and FM to define all requirements and associated costs.			
10.	Electronic Training Aids - Inability of FM to develop and utilize electronic training aids based on the latest available technical data.			
	1.3.6 - Life Cycle Software Support			
1.	Software Facilities/Equipment - Inability of FM to acquire and use facilities and equipment needed for Software Support. Big capital investment.			
2.	Software Expertise - Failure of the FM to acquire the appropriate expertise in life cycle software support.			
3.	Requirements Coordination - Failure of the FM to coordinate requirements with customer on different issues such as interoperability, policies, mandates, digitization of battlefield			
4.	Software Support Transition - Failure to properly and efficiently transfer responsibilities of software support from the Govt. to the FM. Inappropriate time and scope of transition.			
5.	Software P3I - Inability of FM to perform Software P3I.			
6.	Training - Inability of Govt. or FM to provide needed customer training on software applications.			
	1.4 - MANUFACTURING/MAINTENANCE			
	1.4.1 Manufacturing			
1.	Experience and Technical Expertise - Failure of FM from obtaining experienced personnel with the appropriate technical expertise to effectively manufacture equipment.			
2.	Operations Startup - Failure of FM to plan and recognize all factors relating to startup operations - e.g. undefined costs and requirements.			
3.	Technical Data - Inability of FM to obtain correct and appropriate technical data from Govt. necessary for manufacturing operations.			
4.	Labor Force/Management Disputes - Failure of FM to resolve all labor disputes that could effect operations - e.g. Labor union/employee strike.			
5.	Raw material/Parts Availability - Inability of FM to obtain/acquire necessary raw material/parts needed for manufacture operations.			

6.	Commercial Business Practices - Inability of FM to fully use commercial business practices - e.g. inability to achieve an efficient economic production rate.			
7.	Facilities/Equipment - Inability of FM to acquire needed facilities and/or equipment or to use Govt. equipment and/or facilities.			
	1.4.2 Maintenance			
1.	Experience and Technical Expertise - Failure of FM from obtaining experienced personnel with the appropriate technical expertise to effectively maintain equipment.			
2.	Raw material/Parts Availability - Inability of FM to obtain/acquire necessary raw material/parts needed for manufacture operations.			
3.	Commercial Business Practices - Inability of FM to fully use commercial business practices - e.g. inability to achieve an efficient economic production rate.			
4.	Organic Capability - Loss of higher echelon maintenance expertise by the Govt.			
5.	Contractor on the Battlefield - liability or lack of presence of FM to provide maintenance support in times of war.			
6.	TM/Manual Support - Inability of FM to provide timely and accurate manuals.			
7.	Facilities/Equipment - Inability of FM to acquire needed facilities and/or equipment or to use Govt. equipment and/or facilities to perform maintenance operations.			
8.	Deployed Operations - Inability of FM to provide maintenance support when deployed.			
9.	Communications Capability - Inability to implement direct communication between the customer and the FM. Inability of FM to establish/provide electronic interface with customers.			
10.	Automated Maintenance Tools - Inability of FM to develop, distribute, utilize automated maintenance tools that will aid/facilitate difficult maintenance and operational problems.			
11.	Field Maintenance - Disruption of maintenance operations due to imposing the FM in the process.			
	1.4.3 - Modifications and Conversions			
1.	Experience and Technical Expertise - Failure of FM from obtaining experienced personnel with the appropriate technical expertise to effectively modify/change equipment.			
2.	Parts Availability - Inability of FM to obtain/acquire necessary parts needed for modification/conversions			
3.	Technical Data - Inability of FM to obtain correct and appropriate technical data from Govt. necessary for modifications/conversions.			

4.	Facilities/Equipment - Inability of FM to acquire needed facilities and/or equipment or to use Govt. equipment and/or facilities to perform modifications/conversions.			
5.	Commercial Business Practices - Inability of FM to fully use commercial business practices - e.g. inability to achieve an efficient economic modification/conversion rate.			
6.	Contractor on the Battlefield - Liability or lack of presence of FM to provide conversions/modifications in times of war.			
	1.4.4 - End Item & Secondary Item Repair/Overhaul			
1.	Experience and Technical Expertise - Failure of FM from obtaining experienced personnel with the appropriate technical expertise to effectively repair/overhaul items.			
2.	Parts Availability - Inability of FM to obtain/acquire necessary parts needed for repair/overhaul.			
3.	Technical Data - Inability of FM to obtain correct and appropriate technical data from Govt. necessary for repair/overhaul.			
4.	Facilities/Equipment - Inability of FM to acquire needed facilities and/or equipment or to use Govt. equipment and/or facilities to perform repair/overhaul.			
5.	Commercial Business Practices - Inability of FM to fully use commercial business practices - e.g. inability to achieve an efficient economic repair/overhaul rate.			
6.	Contractor on the Battlefield - Liability or lack of presence of FM to provide conversions/modifications in times of war.			
7.	Organic Capability - Loss of program history/lessons learned by the Govt. in performing repair/overhaul.			
8.	Field Maintenance - Disruption of maintenance operations due to imposing the FM in the process.			

ADDITIONAL COMMENTS

1. Use the space below to comment on any of the risks identified.

2. If you do not understand a particular risk event please reference using the WBS#.

3. If there are risk events that you feel should be included in this survey please write the risk event in the space below. Use the scale to assess the risk and cross-reference the risk event to the appropriate WBS#.

APPENDIX C: M109 FLEET MANAGEMENT RISK EVENT WATCHLISTS

A. PROGRAM MANAGEMENT RISK EVENT WATCHLIST

Ranking	Risk Event	CONOPS #	RES
1	Funding	1.1.4	24.5
2	Govt Experience	1.1.1	19.5
3	Retention of Personnel	1.1.1	18.89
4	Pricing	1.1.4	18
5	Project Milestones	1.1.1	17.22
6	Govt Employee Resistance	1.1.2	17
7	Non Performance by FM	1.1.1	16.97
8	Unrealization of Savings	1.1.4	16.91
9	Organic capability	1.1.5	16.91
10	Transition Planning - Cont O/S	1.1.1	16.667
11	Retention of Personnel - G/M	1.1.2	16.52
12	Ineffect Contract Structure	1.1.1	16.44
13	Govt Employee Union	1.1.2	16.33
14	Parts Inventory Ownership	1.1.3	16.05
15	Dispossession of Curr Parts Invt	1.1.4	16.05
16	Perf Metrics and Incentives	1.1.1	16
17	Legal Conflicts	1.1.2	16
18	Loss of Program Knowledge	1.1.5	16
19	Complexity of Contract	1.1.1	15.5
20	Retreat plan	1.1.2	15.1667
21	Contingency Response	1.1.2	15
22	Transition Planning	1.1.2	15
23	Retreat Plan	1.1.5	15
24	Front end Funding	1,1,4	14.77
25	Future Program Needs	1.1.5	14.58
26	Repair Wk/Fld Maint.	1.1.5	14
27	Transition Planning	1.1.4	13.77
28	Scope of Parts Supply	1.1.3	13.75
29	Personnel Management	1.1.2	13.22

A. PROGRAM MANAGEMENT RISK EVENT WATCHLIST CONTINUED

Ranking	Risk Event	CONOPS #	RES
30	Transition to Readiness Cmd	1.1.5	13.22
31	Software Requirements	1.1.3	12.91
32	Approval Level	1.1.5	12.91
33	Changing Requirements	1.1.3	12.88
34	Commercial Buss. Practices	1.1.3	12.5
35	War Reserve	1.1.5	12.33
36	Day to Day Exposure	1.1.1	12.27
37	Communications	1.1.2	12.05
38	Complexity of Requirements	1.1.3	12.05
39	FMS	1.1.5	11.667
40	Bankruptcy	1.1.2	11.3
41	Loss of Organic Capability	1.1.3	10.88
42	Customer Satisfaction	1.1.3	10.83
43	Centralization	1.1.5	10.83
44	Data Availability	1.1.4	10.5
45	Requisition Spending Controls	1.1.4	10.47
46	Status Reporting	1.1.4	10.11
47	Status Reporting	1.1.1	9.72
48	Security	1.1.2	8.55
49	Financial Pricing Methodology	1.1.4	7

B. FLEET LOGISTICAL SUPPORT RISK EVENT WATCHLIST

Ranking	Risk Event	CONOPS #	RES
1	Fleet Mangt Baseline Change	1.2.3	20.81
2	Contractor on the Battlefield	1.2.3	20.16
3	Transition Planning	1.2.1	19
4	Parts Inventory Mangt	1.2.1	18.37
5	Scope of Parts Supply	1.2.1	18.22
6	Contractor on the Battlefield	1.2.6	18.22
7	Govt Changes - Downsizing	1.2.1	17.57
8	Deployed Operations	1.2.2	16.65
9	Repair Parts Availability	1.2.2	16.65
10	Disposition of Curr Inventory	1.2.1	16.53
11	Contingency Response	1.2.1	16.53
12	Communications Capability	1.2.2	15.96
13	Comm Business Practice	1.2.1	15.92
14	Customs Delays	1.2.2	15.8
15	Deployed Operations	1.2.6	15.61
16	Funds Availability	1.2.5	15.35
17	DBOF Replenishment	1.2.1	14.69
18	War Reserve	1.2.1	14.69
19	Scope of Supply Parts	1.2.2	14.29
20	Communications Capability	1.2.6	14.04
21	FM Facilities	1.2.4	13.71
22	Cost Considerations	1.2.6	13.53
23	Organic Capability	1.2.3	13.47
24	Incompatible FM processes	1.2.1	13.18
25	Communications Capability	1.2.7	13.16
26	Pricing	1.2.1	13.14
27	Commercial Transport	1.2.2	13.14
28	Doctrinal Changes	1.2.5	13.06
29	Business Hardware/Software	1.2.6	12.85
30	Business Hardware/Software	1.2.7	12.57

B. FLEET LOGISTICAL SUPPORT RISK EVENT WATCHLIST CONTINUED

Ranking	Risk Event	CONOPS #	RES
31	Acquisition Reform	1.2.1	12.29
32	Environmental Concerns	1.2.4	12.2
33	Political Process	1.2.4	12.08
34	Accountability Compatibility	1.2.2	11.76
35	Parallel Govt. Log Representative	1.2.6	11.51
36	Technical Expertise	1.2.3	11.14
37	Training	1.2.6	11.14
38	Status Reporting	1.2.1	11.02
39	Status Reporting	1.2.7	10.86
40	TM/Manual Maint/Distribution	1.2.3	10.04
41	Technical Support	1.2.6	10.04
42	Priority Setting	1.2.2	9.82
43	Training	1.2.5	9.8
44	Existing Sample Data Coll. Methods	1.2.7	9.8
45	Data Collection	1.2.7	9.55
46	Sources of Supply	1.2.1	8.37
47	Status Reporting	1.2.2	7.96
48	Total Asset Visibility	1.2.2	7.96

C. SYSTEM TECHNICAL SUPPORT RISK EVENT WATCHLIST

Ranking	Risk Event	CONOPS #	RES
1	Lack of Incentive by FM	1.3.5	22.78
2	Contractor on the Battlefield	1.3.5	21.85
3	Funding	1.3.4	19.41
4	Prog History/Lessons Learned	1.3.1	19.4
5	Objectivity of FM Conducting Test	1.3.3	19.05
6	Technical/Funct Experts	1.3.1	18.78
7	Unnecessary Changes	1.3.2	18.36
8	Modernization Thru Spares	1.3.4	18
9	Interoperability	1.3.2	17.88
10	TDP Changes	1.3.2	17.62
11	Communications Capability	1.3.5	16.73
12	Commo Interoperability	1.3.1	16.56
13	Requirements Coordination	1.3.4	16.53
14	P3I Approval	1.3.4	16.5
15	Business Hardware/Software	1.3.5	16.32
16	Prod Improvement Opportunity ID	1.3.4	16.16
17	Configuration Management	1.3.2	15.75
18	P3I Prioritization	1.3.4	15.45
19	Testing Expertise	1.3.3	15.31
20	Deployed Operations	1.3.5	14.92
21	Testing Resources	1.3.3	14.69
22	Undefined Cost Requirements	1.3.5	14.45
23	Safety	1.3.1	14.34
24	Testing P3I	1.3.4	14.09
25	Change Approval	1.3.2	13.75
26	Technical Data	1.3.1	13.39
27	Scope of Spare Parts	1.3.1	12.65
28	Cost Considerations	1.3.5	12.08
29	Technical Support	1.3.5	11.42
30	Customer Satisfaction	1.3.5	11.15
31	Training	1.3.5	10.85
32	Electronic Training Aides	1.3.5	10.41

D. MANUFACTURING/MAINTENANCE RISK EVENT WATCHLIST

Ranking	Risk Event	CONOPS #	RES
1	Contractor on the Battlefield	1.4.2	19.6
2	Contractor on the Battlefield	1.4.4	18.42
3	Organic Capability	1.4.3	17.87
4	Contractor on the Battlefield	1.4.3	17.77
5	Organic Capability	1.4.1	16.63
6	Deployed Operations	1.4.2	16.44
7	Commercial Bus Practices	1.4.1	15.86
8	Automated Maintenance Tools	1.4.2	14.58
9	Technical Data	1.4.3	14.57
10	Labor/Mgt. Disputes	1.4.1	14.04
11	Technical Data	1.4.1	13.59
12	Technical Data	1.4.4	13.59
13	Organic Capability	1.4.2	13.47
14	Organic Capability	1.4.4	13.28
15	Commercial Buss Practices	1.4.4	13.22
16	Commercial Buss Practice	1.4.3	12.85
17	Experience and Tech. Expertise	1.4.3	12.24
18	Commercial Buss Practices	1.4.2	11.79
19	Operational Start-up	1.4.1	11.75
20	Experience and Tech. Expertise	1.4.4	11.42
21	Communications Capability	1.4.2	10.88
22	Facilities/Equipment	1.4.1	10.41
23	Facilities/Equipment	1.4.4	10.41
24	Field Maintenance	1.4.2	10.33
25	Experience and Tech. Expertise	1.4.2	9.8
26	Field Maintenance	1.4.4	9.66
27	Experience and Tech. Expertise	1.4.1	9.55
28	Facilities/Equipment	1.4.2	9.43
29	Facilities/Equipment	1.4.3	9.42
30	TM/Manual Support	1.4.2	8.86
31	Raw Material/Parts Availability	1.4.1	8.33
32	Parts Availability	1.4.3	7.84
33	Parts Availability	1.4.4	7.83
34	Raw Material/Parts Availability	1.4.2	7.1

LIST OF REFERENCES

1. Camm, Frank, Expanding Private Production of Defense Services, Rand Corporation, 1996.

2. Commission on Roles and Missions of the Armed Forces, Directions for Defense, Washington, DC, May 24,1995.

3. Coopers & Lybrand Consulting, Material Management Outsourcing Business Case Study, March 10, 1997.

4. Defense Acquisition Deskbook, Risk Management, Version 2.0, June 30, 1997.

5. Defense Science Board, Final Report of the Defense Science Board on Outsourcing and Privatization, Office of the Secretary of Defense, August 27, 1996.

6. Defense Systems Management College, Program Manager's Notebook, August 1995.

7. Defense Systems Management College, Risk Management, Concepts and Guidance, March 1989.

8. Defense Systems Management College, Systems Engineering Management Guide.

9. Department of the Army, Army Regulation 70-1, Army Acquisition Policy, Washington, DC, 1993.

10. Department of Defense, Defense LINK Homepage: Quadrennial Defense Review, http://www.dtic.mil/defenselink/pubs/qdr/

11. Department of Defense, DOD Directive 5000.1, Defense Acquisition, March 15, 1996.

12. Department of Defense, DOD Regulation 5000.2, Mandatory Procedures for Major Defense Acquisition Programs, March 15, 1996.

13. Forsberg, Kevin and Mooz, Hal, Visualizing Project Management, New York: John Wiley & Sons Inc., 1996.

14. Karafa, Paul A., "An Analysis of Risk Management Methodology Employed within the Advanced Amphibious Assault Vehicle Acquisition Program," Master's Thesis, Naval Postgraduate School, March 1995.

15. Kerzner, Harold, Project Management, A Systems Approach to Planning, Scheduling, and Controlling, New York: Van Nostrand Reinhold, 1995.

16. Office of the Inspector General, Audit Report: Risk Management Programs for Defense Acquisition Systems, Report No. 96-162, June 14, 1996.

17. Paladin Program Management Office, M109 Family of Vehicles Fleet Management Pilot Program: Concept Definition, 2 May 1997.

18. Paladin Program Management Office, M109 Family of Vehicles Fleet Management Pilot Program Presentation to: III Corps Paladin Artillery Community, Ft. Sill, OK, by LTC Knute E. Hankins, 10 December 1996.

19. Paladin Program Management Office, M109 Family of Vehicles Fleet Management Plan: Chapter 7 Risk Analysis, Draft October 1997.

20. Paladin Program Management Office, M109 Family of Vehicles Fleet Management Cost Benefit Analysis, April 1997.

21. Paladin Program Management Office, M109 FOV Fleet Management Concept of Operations Summary, 20 February 1997.

22. Project Management Institute, Project Management Body of Knowledge, Project Risk Management - Chapter 11, 1996.

23. Project Management Institute, Project Risk Management, 1996.

24. Schaller, Michael, "An Examination of Risk Management Techniques in the Lightweight 155mm Howitzer Program," Master's Thesis, Naval Postgraduate School, December 1995.

25. Simmons, Chester, Managing Standards Home Page: Risk Management, http://www.airtime.co....ers/wysywig/risk_1.htm

26. Snyder, Elizabeth, "Public or Private: The Outsourcing Dilemma within the Department of Defense," Master's Thesis, Naval Postgraduate School, March 1995.

27. Steves, Michael R., "An Examination of the Department of Defense Risk Management Policy for Nondevelopmental Items Acquisition Programs," Master's Thesis, Naval Postgraduate School, March 1995.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center 2
   8725 John J. Kingman Road, Suite 0944
   Fort Belvoir, VA 22060-6218

2. Dudley Knox Library 2
   Naval Postgraduate School
   411 Dyer Road
   Monterey, CA 93943-5101

3. Defense Logistics Studies Information Exchange 1
   U.S. Army Logistics Management College
   Fort Lee, VA 23801-6043

4. Office of PM Paladin/FAASV 2
   (AMSTA-DSA-PAL, Bldg 171 N)
   Picatinny Arsenal, NJ 07806-5000

5. Prof. David V. Lamm (Code SM/Lt) 3
   Naval Postgraduate School
   Monterey, CA 93943-5103

6. Prof. Keith F. Snider (Code SM/Sk) 2
   Naval Postgraduate School
   Monterey, CA 93943-5103

7. Prof. David F. Matthews (Code SM/Md) 1
   Naval Postgraduate School
   Monterey, CA 93943-5103

8. Ernest Hitz, Jr. 2
   350 First Ave., #8F
   New York, NY 10010